PACKAGE engineering

Now—actual data on gas permeability of pouches

Reviewing the results (with quantitative figures) of extensive tests of the gas permeability of pouches made from a number of flexible packaging materials under varying exposure conditions. (See page 21)

What corrosive liquids do to machinery

To protect packaging equipment against the effects of volatile liquids (such as vinegar) as well as the effects of water a persistent clean-up and lubrication program is necessary. (See page 26)

Checking the quality of multiwall bags

A discussion of visual and practical guides to multiwall bag quality control, with suggestions for the refinement of current tests — to give users and producers of bags better tests than they now have. (See page 29)

Complete table of contents on Page 2

In this Issue—
Our editorial index for 1956
Starting on Page 40

JANUARY 1957

VOLUME 2 • NUMBER 1

consult

Package Research & Development

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Aluminum Foil Packaging as Protection Against Contamination

Report No. 7 of a Series by Reynolds Metals Company

Contamination in packaged goods is usually taken to mean the introduction of harmful impurities into originally pure package contents. This can occur in three ways. One, contamination may take place *through* the packaging, from the outside. Two, it may be caused by some taste or odor generated by the packaging material itself. Three, it may be caused by microorganisms which find lodging in the surface of a packaging material.

In countering all of these possible causes of contamination, aluminum foil rates very high. Its efficiency is attested by the widespread use of foil packaging among food processors, who are always zealous in safeguarding the quality of their products. Aluminum foil's freedom from contamination and resistance to contaminants are properties well recognized by homemakers in their daily use of Reynolds Wrap, pure aluminum foil, in their own kitchens.

In preventing contamination by the first method named above, aluminum foil acts as a *barrier*. Here it excels. It not only protects package contents from such outside contaminants as dust, liquids and air borne impurities; it also performs the tougher jobs of protecting against moisture vapor, noxious gases and odors. An example of such protection is the use of aluminum foil for packaging butter and margarine—products highly susceptible to absorption of foreign odors and flavors.

©Reynolds Metals Company, Louisville, Kentucky

The attached graph compares the score* of butter wrapped in foil with butter wrapped in a commercially used parchment paper, during a three-day exposure to garlic odor.

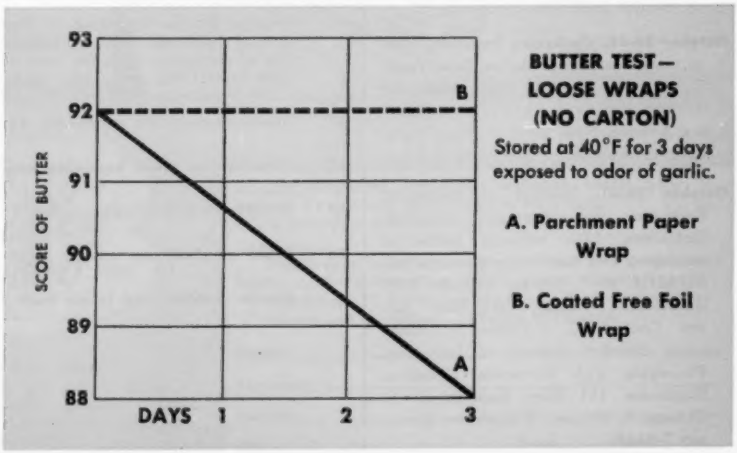
As to contamination by the packaging material itself—this, of course, is not possible with aluminum foil. Naturally free of any taste or odor, aluminum foil will not develop off-tastes or odors even under extreme temperature variations.

Aluminum foil is also completely non-toxic. This is readily apparent from the long established preference for aluminum cooking utensils and from the more recent and fast growing use of aluminum foil containers for heat-and-serve food products. Aluminum foil is officially accepted by the Pure Food and Drug Administration of the United States Department of Agriculture, which prohibits the use of toxic materials for food packaging.

The third indicated method of contamination—by microorganisms on the surface of a packaging material—is defeated by the pure metallic surface of aluminum foil, which does not support growth of molds, yeast or bacteria. Furthermore, the annealing process for aluminum foil subjects the material to temperatures far in excess of those necessary to destroy any microorganisms.

Reynolds research facilities and experience in solving particular packaging problems requiring the utmost in protection against contamination are available through Reynolds regional representatives. Or **Reynolds Metals Company**, General Sales Office, Louisville 1, Ky.

*Score is a measure of butter quality premised on a maximum rating of 100.



For your calendar

February 16-19. National Canners Association 50th anniversary convention, Conrad Hilton Hotel, Chicago. Contact: R. B. Heiney, assistant to secretary, National Canners Association, 1133 20th Street, N.W., Washington 6, D. C. *Telephone: Executive 3-7030.*

February 16-19. Canning Machinery & Supplies Association 50th anniversary exhibit, Conrad Hilton Hotel, Chicago. Contact: W. D. Lewis, secretary, Canning Machinery & Supplies Association, 4630 Montgomery Avenue, Washington 14, D. C. *Telephone: Oliver 6-6979.*

April 8-11. American Management Association national packaging conference, Palmer House, Chicago. Contact: John A. Warren, American Management Association, 1515 Broadway, New York 36, New York. *Telephone: Judson 6-8100.*

April 8-11. American Management Association national packaging exposition, International Amphitheatre, Chicago. Contact: John A. Warren, American Management Association, 1515 Broadway, New York 36, New York. *Telephone: Judson 6-8100.*

April 23-25. Research and Development Associates, Food and Container Institute annual meeting, Richmond, Virginia. Contact: Rohland A. Isker, secretary, Research and Development Associates, Food and Container Institute, 1819 West Pershing Road, Chicago 9, Illinois. *Telephone: Lafayette 3-5500, extension 4262.*

May 12-16. Institute of Food Technologists annual meeting, William Penn Hotel, Pittsburgh. Contact: Charles S. Lawrence, executive secretary, Institute of Food Technologists, 176 West Adams Street, Chicago 3, Illinois. *Telephone: Andover 3-6268.*

October 28-30. Packaging Institute, 19th annual forum, Hotel Statler, New York Contact: Charles A. Feld, executive director, Packaging Institute, 342 Madison Avenue, New York 17, New York. *Telephone: Murray Hill 7-8875.*

October 28-31. Society of Industrial Packaging and Materials Handling Engineers, 12th national industrial packaging and handling exposition and SIPMHE short course, Atlantic City Auditorium, Atlantic City, New Jersey. Contact: C. J. Carney Jr., managing director, Society of Industrial Packaging and Materials Handling Engineers, 111 West Jackson Blvd., Chicago 4, Illinois. *Telephone: Harrison 7-6123.*

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PACKAGE engineering

AN ANGUS J. RAY PUBLICATION

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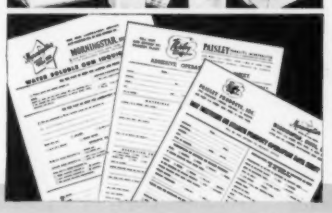

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A note from the Publisher

Thousands and thousands of words and pictures are printed each month about "impulse buying" in the packaging field. In a highly competitive field like food, in which packaging has evolved into an advanced stage of development, I question whether there is such a thing as pure "impulse buying" prompted by package appearance alone. Twenty-five years ago, when the old brand of crackers was in a barrel and the new brand was in an attractive two-color package, yes — or ten years ago when the old brand was in a two-color package and the new brand was in a four-color package, yes. But not today.

Today, attractive packages are more or less taken for granted, and the big battle amongst packaged brands is being waged in the engineering departments and package development laboratories, where costs are cut and package performance is increased through structural design or adding useful values to a package.

Today, a penny-a-package difference in a supermarket can mean the difference between sales success or failure and this penny difference is saved in good package engineering.

The companies who are winning the battle in the supermarkets are the companies who are spending money on package engineering and are willing to pay salaries high enough to attract and keep able men in this type of work. Generally speaking, salaries are much too low in this area of packaging in relation to the amount of increased profit a well run and well organized package engineering department can make for a company.

Good package engineering means selecting a package or packaging material that will give best protection at minimum cost and developing a packaging line that operates at the lowest possible cost. Selecting the proper package involves using considerable judgment, as buying *perfect* protection can mean pricing one's product out of the market. The package that provides optimum protection usually is one that will be slightly less than perfect, as the expense caused by an occasional package failure is less than engineering a package that is perfect.

It may be the big red letters on the surface design of a package that get the buyer over to the shelf in the supermarket, but it is the quality product that has been packaged scientifically, to give the greatest value at the least cost, that rings up the sale.

Angus J. Ray
Publisher

PACKAGE engineering

AN ANGUS J. RAY PUBLICATION

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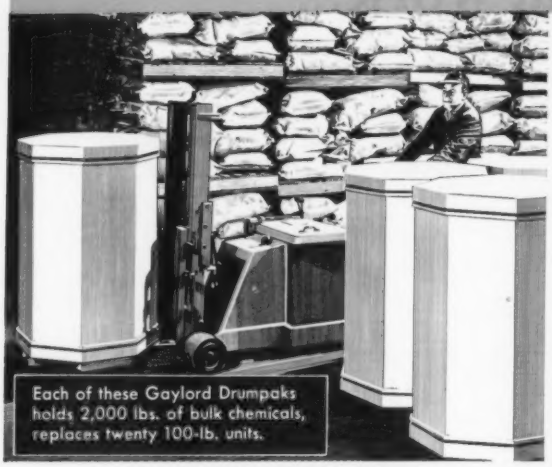
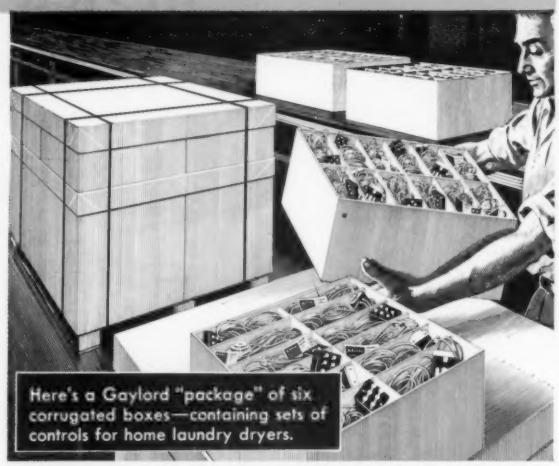


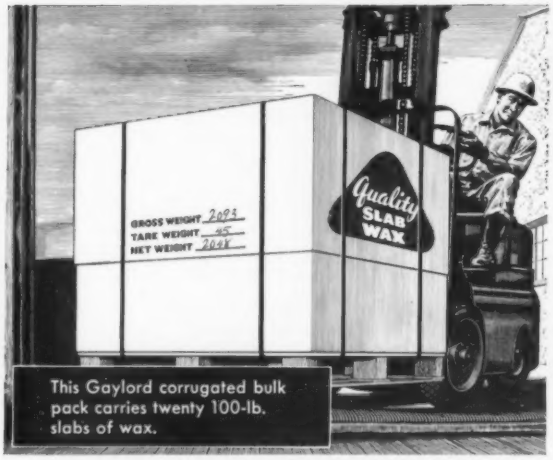
Each of these Gaylord Drumpaks holds 2,000 lbs. of bulk chemicals, replaces twenty 100-lb. units.

. . . save 20 to 25 manhours per car . . .



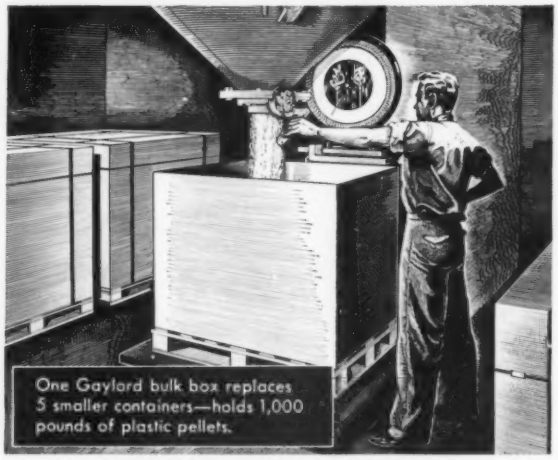
Here's a Gaylord "package" of six corrugated boxes—containing sets of controls for home laundry dryers.

. . . handling time costs cut 65% . . .



This Gaylord corrugated bulk pack carries twenty 100-lb. slabs of wax.

. . . cuts manhours in weighing and loading . . .



One Gaylord bulk box replaces 5 smaller containers—holds 1,000 pounds of plastic pellets.

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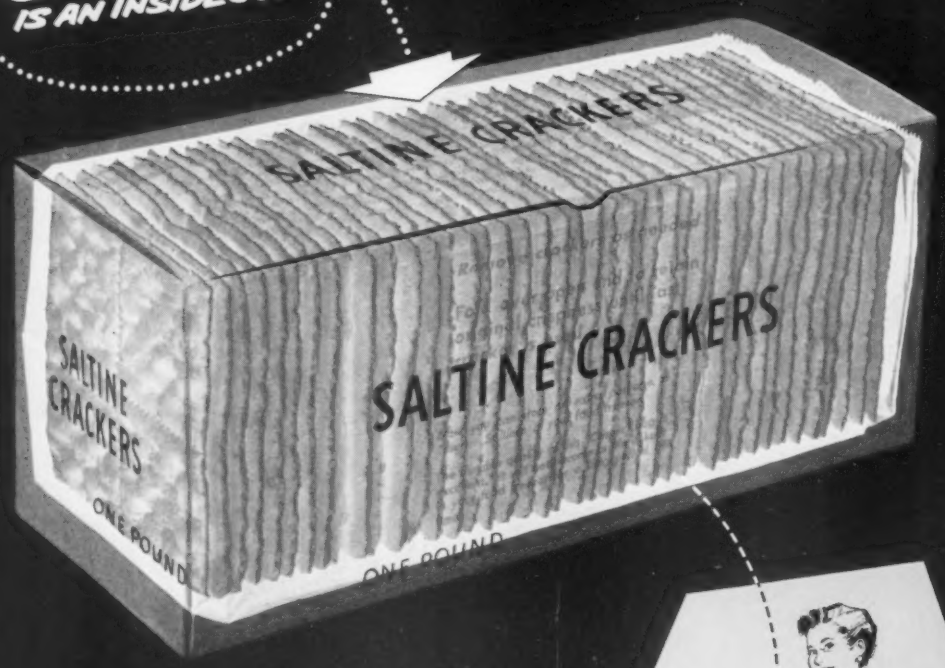
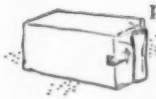


X-Ray Photograph of actual cracker package

Ever wonder why some crackers taste fresher than others? The X-ray photograph above contains the answer. Inside this box of crackers is an inner bag of wax-laminated Rhinelander Glassine paper. This dense, almost impenetrable paper keeps moisture-vapor from robbing crackers of their crispness.



The inner bag has excellent dead-folding qualities . . . can be opened and positively re-closed many times, protecting cracker crispness to the very last one! Glassine does this job economically—actually at a lower unit cost than most other protective packaging materials. If you have a product requiring a moistureproof package, let us show you how economically Rhinelander Glassine can work for you.

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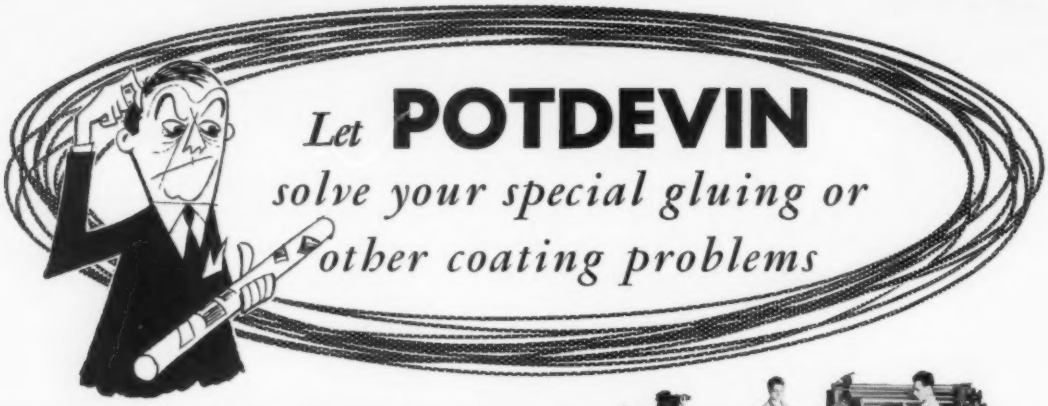

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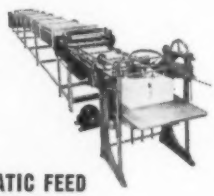

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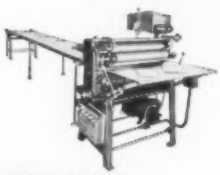

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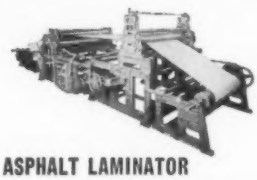
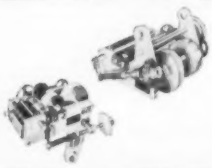


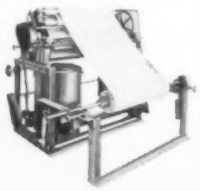
ASPHALT LAMINATOR

Laminates asphalt paper to burlap, paper to paper or paper to fabric.



TOPSIDE or UNDERSIDE COATER

Applies solid or strip coating on traveling webs (vertical or horizontal).



HEAVY DUTY WEB COATER

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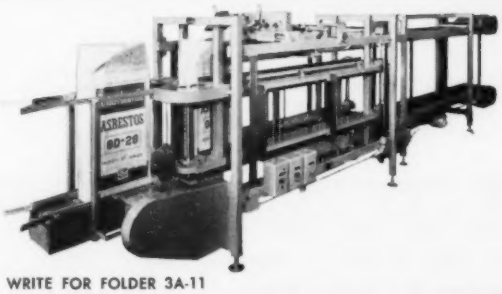

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Packomatic Bale Sealers, originally designed to handle, glue and seal paper shipping bales up to 100 lbs. weight, can be customized by our engineers for a combination of weights and sizes within these dimensions:

RANGE: *Length:* 9″ to 18″ in 6″ increments
Width: 5″ to 9½″ in 2″ increments
Height: 14″ to 40″ in 6″ increments

SPEED: The regular Bale Sealer is designed for speeds up to 1000 bales per hour.

CONSTRUCTION: This machine is a heavy-duty machine featuring sturdy, square tubular framework, heavy-duty chains, oversize bearings, heavy-duty reduction units and positive safety stop devices.

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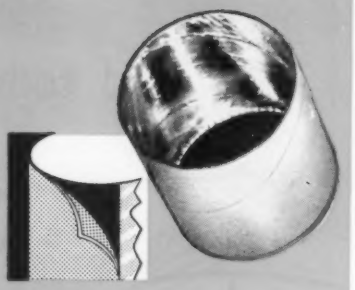
J. L. FERGUSON COMPANY Joliet, Illinois

New York, Chicago, Cleveland, Boston, Tampa, Baltimore, Portland, Denver, Los Angeles, San Francisco, Seattle, New Orleans, Louisville, Kansas City and all principal Canadian cities.

LARDPAK LINER.
Lardpak liner inside, then fibre, and printed Lardpak paper used outside. A grease barrier for scores of materials. Example of use: caulking compounds.

LARDPAK, PITCH-BACKED.
This combination offers the packer both grease and moisture resistance. Example of use: various chemicals.

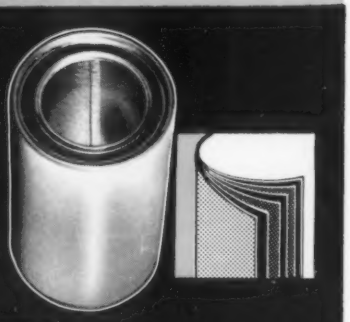


FOIL LINER.
Foil backed by pitch followed by two layers of fibre laminated with glue. Pitch serves two purposes: As adhesive for foil (2) sealer for pin holes in foil. Example of use: seed inoculants.

• There are many sides

to the R. C. FIBRE CAN Packaging Story

• a complete line to fit your packaging needs

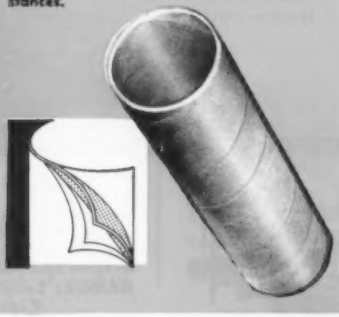


CHIP KB.
Pitch layers between layers of fibre, for moisture resistance. Convolute can shown here. Example of use: wallpaper cleaner, cold water paints.

Have You a Fibre Can Packaging Problem?
Contact your nearest R. C. Sales Office for experienced advice. There's no obligation.

PARAFFIN COATING.
Parrafin lining obtained two ways: spiral wound from coated fibre, or sprayed in convolute can. Example of use: meth crystals, drugs, etc.

LAMINATED KLEERWRAP.
Lardpak liner inside, followed by fibre, followed by two pieces of glassine laminated together with wax. High grease and moisture resistance. Example of use: caulking compounds and similar "greasy" substances.



FOIL PAPER-BACKED.
Foil backed up by 20 lb. white bond paper, which serves as inside ply of container. Ideal for packaging that requires both moisture and grease resistance. Example of use: ready-to-heat biscuits, and similar food products.

R·C· CAN COMPANY

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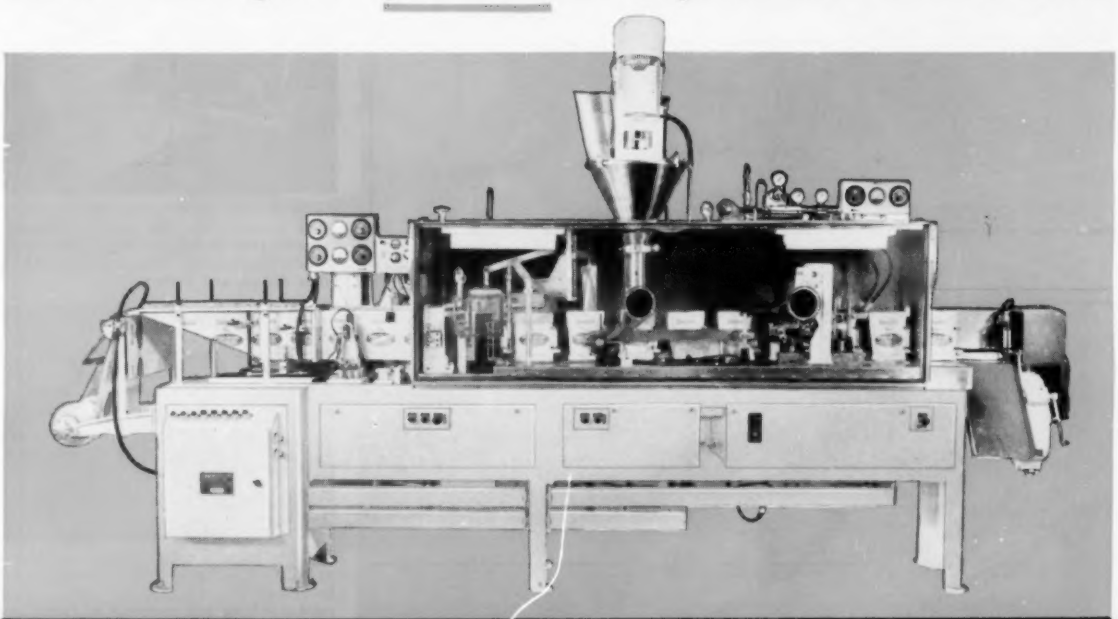
FAST, AUTOMATIC PACKAGING

under inert gas... protects food products at low cost



Bartelt Packager... Forms Package from Roll of Stock... Fills and Seals... and Automatically Cartons

Special adaptations of Bartelt Packaging Lines illustrate the tremendous versatility of which they are capable. Above you see a gas-pack machine made up of basic Bartelt units which fill under inert gas.

FILLS ONE POUND

The package formed contains *one pound* of a Dean's powdered milk product. French's Instant Potato is also packaged in pouches under inert gas, and then cartoned on the standard Bartelt Cartoner. Many other products can be protected, with 2% or less oxygen content, by automatic inert gas packaging. The Bartelt Packaging Line will handle a wide variety of sizes of pouches made from various heat-sealing roll stock. Write for complete information, on gas packaging or any other types of pouch or carton packaging.

BARTELT ENGINEERING CO.

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Impossible? Not any more! "Scotchpak" Brand Polyester Film takes a seal as tough as the film itself—and easily: a temperature of 275° to 359°F. and 20-60 psi is all that's required.

"Scotchpak" is the perfect packaging material for critical applications where inertness of the wrapper and protection of the contents under extreme temperature conditions is vital. It resists most solvents and chemicals, has high moisture inertness and high tensile strength.

You can use "Scotchpak" for packaging such varied products as cosmetics, acids, syrups, silverware, oils, greases, adhesives, asphaltics, catsup and mustard, surgical dressings—and many others. It even makes an ideal container liner or insulation pillow.

For more information, send for the folder described at right.

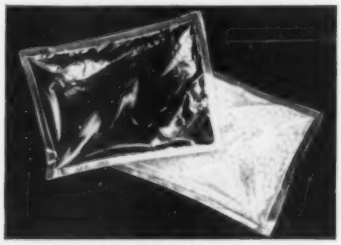
TRADEMARK

"SCOTCHPAK"

BRAND

HEAT-SEALABLE POLYESTER FILM

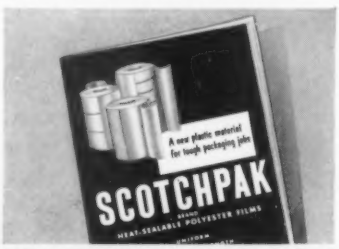
Look what you can do with it!



ACIDS or volatile chemicals can be packaged easily, handled safely, shipped without fear in heat-sealable containers of new "Scotchpak" Polyester Film. Also lines drums and cartons.

FOOD ITEMS are packaged safely in clear-as-glass "Scotchpak" Film. Contents can be frozen . . . even boiled *right in the package*. Low gas penetration rate . . . inert and non-toxic.

METAL PARTS can be packaged dry or in oil or grease to protect them against corrosion. Transparent packages are easy to handle, easy to ship and to store. Simplifies issuing of parts and units.



FREE FOLDER shows dozens of ways you can solve your most difficult packaging and shipping problems with new "Scotchpak" Polyester Film. Just write on your letterhead: Film Products Group, 3M Co., St. Paul 6, Minn., Dept. LY-17.

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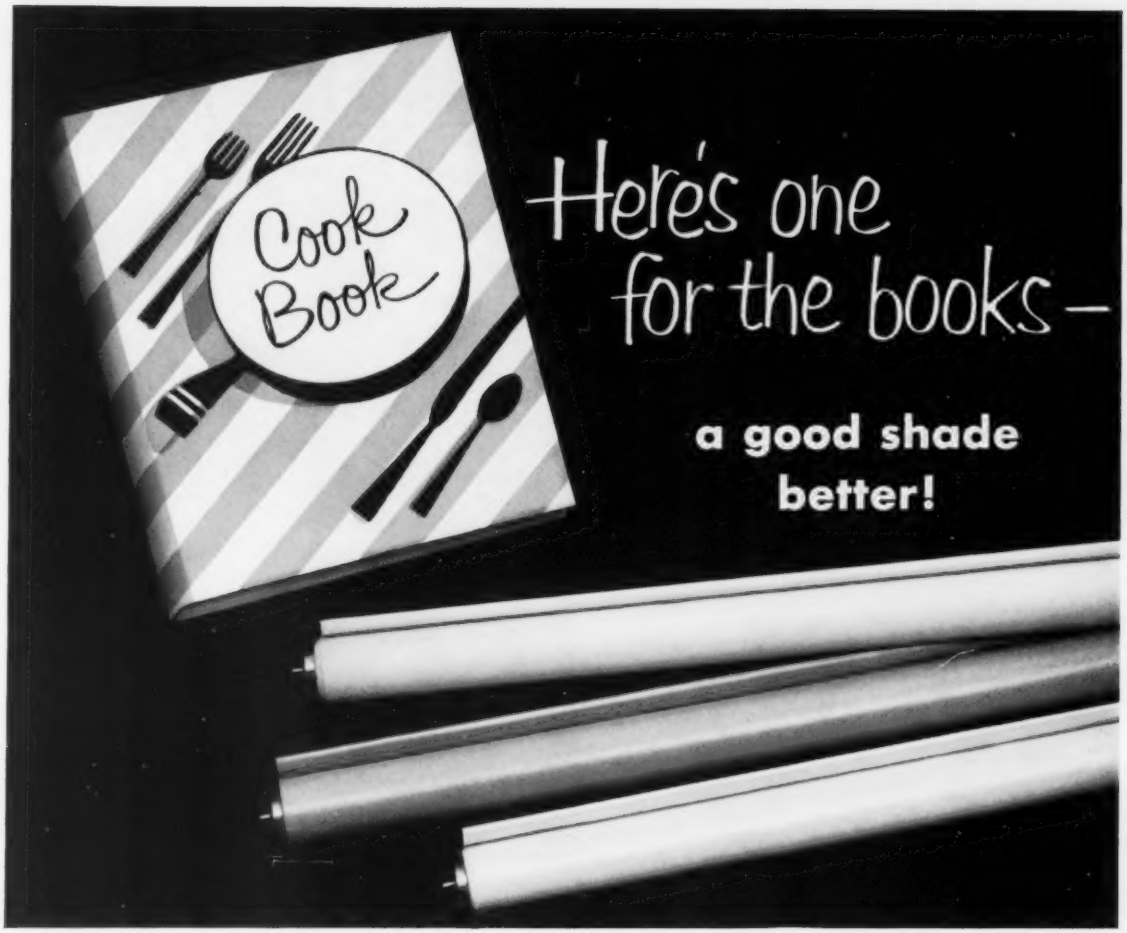

Superior strength, clarity, matchless protection are all combined in this great new packaging film.

It's easy to tell a book by its cover, or a window shade by its color—when they're wrapped in clear, transparent VITAFILM.

You can sense the texture of a product right through it. So hard to break, rip or tear — this newest Goodyear packaging film is ideal for hardware, paper products, textiles and a wide variety of similar items.

ITS CLARITY IS OUTSTANDING—*and its "feel" is better!* It's a fine sales booster because when customers can see what they want, they're more likely to want what they see. It's so strong it withstands rough handling without splitting or tearing. But that's not all.

VITAFILM prints clearly — heat-seals easily — adapts readily to all kinds of packaging machinery. And it's available in bags — perfect for sweaters, underwear, shirts and ties.

How about finding out what VITAFILM — a Polyvinyl chloride—can do for you? Talk it over with the Goodyear Packaging Engineer. Write Goodyear, Packaging Films Dept. A-6432, Akron 16, Ohio.

Vitafilm a new GOODYEAR PACKAGING FILM

The Finest in Sheer Protection

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NOW...THE NEW TRAYMASTER CARTON FORMER!

Forms and Glues a Wide Variety of Cartons Without Messy Glue

Package's new TL-100 Traymaster produces cartons using the widest variety of board stocks, including polyethylene-coated and foil-lined. And with no messy glue! The TL-100 uses a rope-like thermoplastic adhesive that is automatically unwound from a spool, metered, melted and applied to the carton.

There's no glue pot to clean . . . no muss, no waste.

Occupying only 3 square feet of floor space, the TL-100 Traymaster is easily moved to the most convenient location. Available in three models for different carton sizes and speed ranges, the TL-100 will produce up to 100 cartons a minute in size ranges from 2" to 15" long, from 1⅝" to 11½" wide, and from ⅜" to 4" high. Only the simplest, least expensive blanks are required. Trays and cartons are formed with a smooth, unbroken inner surface, since the hinged flaps are sealed to the outside.

A single operator can tend several machines, needs only push the starting switches and keep the magazines supplied with blanks. For information about the money-saving, labor-saving TL-100 Traymaster, phone or write our nearest office.

PACKAGE MACHINERY COMPANY

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SILICONE SURFACE

speeds bottling, packing

***SILICONE SURFACE* helps you...**

improve appearance and life of containers

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GREATER RESISTANCE TO BRUISING AND SCRATCHING

PEPSI-COLA and many other name brand packers now specify a Dow Corning SILICONE SURFACE on exterior of returnable and one-way glass containers.

You'll find it's easier, faster and more economical to bottle or pack your products in glass containers treated with a Dow Corning SILICONE SURFACE. Most container manufacturers offer silicone treatment at little or no extra cost.

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first in silicones

First award, polyethylene bags and pouches—RECORD OF THE MONTH envelope by Wrapture. "Four mil polyethylene dramatically printed by a flexographic process provides fine protection both in shipping and for home reuse . . . appears applicable as replacement for hard albums."

First award, polyethylene sheets and rolls—LADY PEPPERELL blanket package by Nashua. "Printed polyethylene wrap affords complete protection, encourages dramatic display, reveals entire color line at a glance, effects substantial economies over the bulky boxes formerly employed."

award-winning designers use VISQUEEN T. M. film to score top honors

in first national contest for flexible packages. Take *both* firsts, *both* seconds, five of six honorable mentions.

Honorable mention—WALTON-MARSH CO. by Herb-Shelly. "A rather unattractive product covered by 2 mil white polyethylene. Gold and black design provides sales appeal, display needed for impulse sales. Design on back emphasizes many uses, carries printed usage directions. Foltop feature permits removal, easy replacement, storage at home, in stores.

Honorable mention—C. H. SIMON CANDY CO. by Boyertown Packaging Service Corp. "Delightful Pennsylvania Dutch design is appealing and suggests candy origin. The heat-seal 3 mil polyethylene gives adequate protection for difficult product formerly in glass. Breakage eliminated, new outlets opened. Sales have increased consistently."

Honorable mention—J. P. STEVENS INC. by Container Corp. of America. "This 1½ mil printed polyethylene bag replaced rigid acetate containers which required partitioned shipping cases. Novel shape, tasseled closure, affords dramatic display, adds quality touch and smart appearance. Package has completely eliminated breakage problem."

Second award, polyethylene bags and pouches—ARROW SHIRT package by Bemis. "Flip-close top of this polyethylene bag affords protection, yet provides easy inspection and return to package. Gusset bottom opens to exact collar height, yet avoids usual rabbit ears. Replaces shirt box."

Second award, polyethylene sheets and rolls—HONEYSUCKLE BIRDSEYE DIAPERS package by Milprint. "Unique combination of gravure and flexographic printing permits realistic halftone and line reproduction . . . gives product visibility, inventory control and quality distinction."

Whatever the problem, whatever the product, leading designers turn to VISQUEEN film for flexible packages. Textiles, produce, foods, novelties that need both protection and display are naturals for VISQUEEN film. Packages resist breakage in transit and at point of sale. VISQUEEN's unmatched uniformity, stiffness and body mean better, faster performance on the production line, cut packaging cost up to 50%. VISQUEEN won't crack, dry out or get brittle, is unaffected by display lights. VISQUEEN keeps moisture where you want it—in or out of the package, performs well at temperatures as low as minus 70 degrees.

Got a packaging problem? Ask for the help of our technicians.

THE VISKING CORPORATION

Plastics Division, Terre Haute, Indiana

World's largest producers of polyethylene sheeting and tubing

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Honorable mention—SAKS FIFTH AVENUE shoe bag by Wrapture. "Polyethylene bag provides protection from abrasion, replaces former tissue wraps. Appreciated by consumers for re-use in traveling. Carries store name home in attractive form. This package won an honorable mention in outstanding package category, all types."

Honorable mention—PEPPERELL MFG. CC sheet package by Nashua. "Gravure printed polyethylene designs are the latest in a series that was started in 1952. The eye appeal of harmonious designs and pastel sheet colors insures permanent display and quick consumer selection." Pepperell has used flexible packages since 1948.

Sheffield—first to put toothpaste in tubes, in 1892—has served packagers for over half a century in producing billions of tubes for—

MEDICINAL ointments—salves—jellies—extracts.

DRUG AND COSMETIC pastes—creams—shaving preparations—deodorants—depilatories.

INDUSTRIAL AND HOUSEHOLD cements—adhesives—compounds—greases—paints—fillers—food pastes, syrups, and creams.

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. . . . . the vigorous science of designing, creating and producing the collapsible metal tube most perfectly suited to your product—your marketing needs . . . . . is yours for the asking.

The Sheffield Process . . . . . .
. . . . . an exclusive method of manufacturing collapsible metal tubes—is the result of four generations of study, research and manufacture which assures you safe, economical, highest quality tubes.

The Sheffield Technically Trained Representative . . . . . .
. . . . . will gladly explain how Sheffield technical superiority can insure the efficient and dramatic packaging of your product. He is more than just a salesman: he is a technician highly trained in the science of collapsible metal tube packaging.

For full information on Sheffield Tubes, write for our free brochure . . . no obligation, of course!

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C. L. Brickman is a graduate of Defiance College, and of Case Institute of Technology with a B.S. degree in chemical engineering. Since 1953 he has been associated with Standard Packaging Corporation. Prior to this, his connections were with Benj. C. Betner Company, Thomas M. Royal & Company and Goodyear Tire & Rubber Company. His affiliations include American Chemical Society, Rubber Division A.C.S., and TAPPI.

Now we have quantitative data on the gas permeability of pouches fabricated from a variety of materials: In this landmark article Mr. Brickman reviews his test methods and his results with them. They apply to completed packages and to variable circumstances of use — involving wet or dry product exposed to different room and refrigeration conditions.

Measuring gas transmission of flexible materials in pouch form

By C. L. Brickman,
Package Development Laboratory,
Standard Packaging Corporation,
Clifton, New Jersey

The effect of oxygen is harmful to many products. In selecting flexible materials for packaging studies, a knowledge of the gas transmission rate of the material is desirable in order to use a construction having possibilities for meeting a specified shelf life. A low level of oxygen transmission is required for such products as luncheon meat, powdered milk, nut meats, and dry vitamins; or low oxygen transmission plus ability to be permeable to carbon dioxide is required for ground coffee and cheese.

Various methods of determining the gas permeability of sheet materials are given in the literature. From 1945 to date, the manometric method described by Elder (4) and Shuman (9), or modifications of it described by Cartwright (1), Sarge (8), Simril and Hershberger (10), has been used by many laboratories. The method is based on measurement of pressure- or volume-change as the test-gas permeates from the high- to the low-pressure side of the sheet.

Another approach to the measurement of gas permeability is based on changes in partial pressure. By employing different gases on the two sides of the sheet, both being at atmospheric pressure, transmission occurs as a result of the difference in partial pressure which is independent of differences in total pressure (Dalton's law). Methods based on changes in partial pressure are described by Smith and Kleiber (11), Davis (3), and by Landrock and Proctor (7).

Criticism has been made of both general methods given above, which accounts for the various modifications. It is to be noted, however, that in the commercial packaging of a product in an inert atmosphere such as nitrogen, the package is exposed to air, so that the conditions of partial pressure and total pressure prevail in determining transmission rate of oxygen.

The results of measurement of gas permeability, whether by manometric or sweep-gas method, are reported for sheet materials in unit volume per unit area per unit time at a stated temperature (usually 75 — 77°F., 24 — 25°C.), and whether the test gas was wet or dry, since the presence of water vapor may have a marked effect on increasing permeability of some materials, likewise temperature. The results by the various methods do not always agree, because samples and conditions may be different.

In commercial packaging, the product may be dry or wet and exposed to room conditions; or wet, exposed in a refrigerator at 38 — 40°F and 76 — 86% R.H. The permeability values given for flat sheets, manometric or sweep-gas method for one specific condition, are not representative of the results which might be

obtained under actual exposure conditions.

Measurement of gas penetration through pouches has been previously reported but the methods require some form of additional apparatus in which the pouch is anchored or contained. The apparatus of Smith and Kleiber (11) requires a glass diffusion chamber which is closed at one end by immersing the open end of the pouch in mercury.

In the apparatus described by Ellickson, Hasenzahl and Hussong (5), the film is heat-sealed around a molded acrylic form containing holes on all sides to permit gas passage to the film. The wrapped form is placed in a gas-tight jar. If the form is wrapped in air, the test gas is allowed to flow through the jar. Alternately, the form can be wrapped in a gas chamber containing oxygen, nitrogen, or carbon dioxide, then placed in the jar with air surrounding it.

A method has been developed which more nearly simulates actual use conditions. It can use a machine-made pouch, can be adapted to wet or dry atmosphere and exposed to various relative humidities, costs little or only nominal amounts for equipment.

Principle of the method

A shell molded from styrene is inserted in the pouch, to insure a nearly uniform volume, air is exhausted, then it is packed with nitrogen at a specified gauge pressure. If a wet atmosphere inside the pouch is desired, a definite amount of water is also introduced. From 8 to 10 units are made up for each exposure condition. Duplicate samples are examined immediately for percent initial oxygen content, and thereafter at stated intervals. Rate of oxygen permeability is calculated from the free gas-space volume of the pouch, area, time, and change in partial oxygen pressure.

Details and descriptions of apparatus

Consideration was given to equipment available or on hand: (1) Flex-Vac #6-9 machine for gas packaging (See Fig. 1); (2) Beckman oxygen analyzer, Model C, modified by

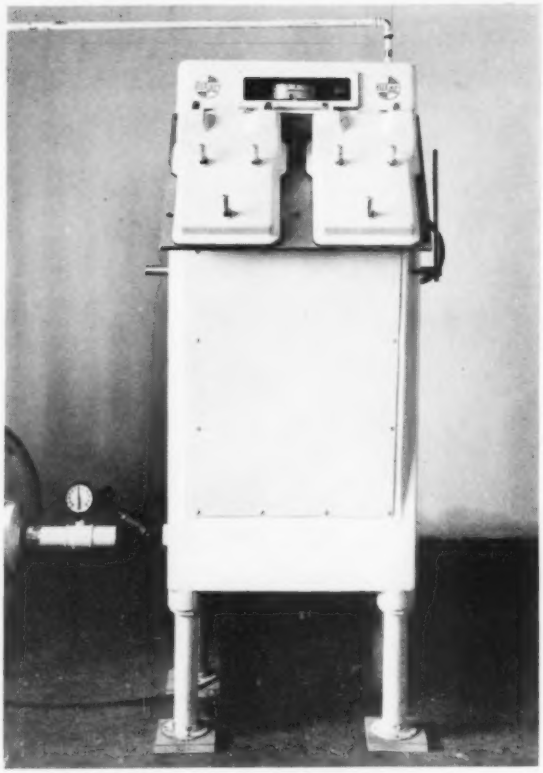

Fig. 1. Flex-Vac No. 6-9 vacuum and controlled atmosphere packaging machine.

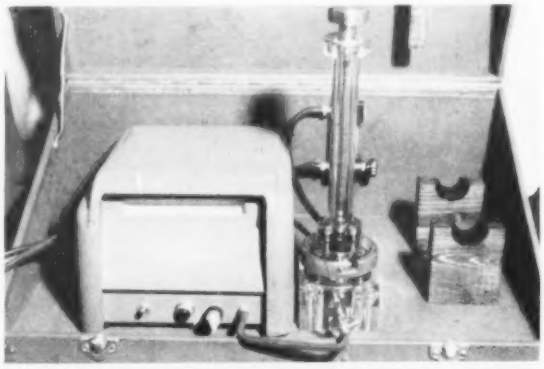

Fig. 2. Beckman analyzer. When measuring oxygen, the instrument is first purged with pure nitrogen from a cylinder of the compressed gas.

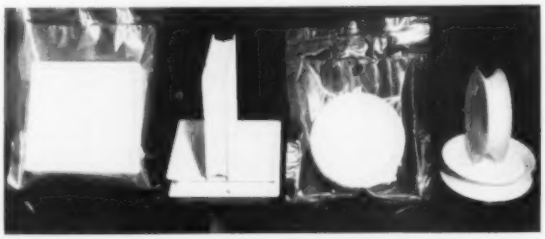

Fig. 3. Types of shells that may be used. Also gas packed shell. Purpose of the shell is to provide a nearly uniform volume of gas in the sealed pouches.

Crown Cork & Seal Co., Inc., Baltimore, Md. (See Fig. 2); (3) Machine for vacuum forming of shells.

Shell for support of material and to obtain uniform volume in the gas packaging operation

The shells are vacuum-formed in a 4-cavity mold from a sheet of Styron H 744 White (Dow) 12" x 12" x 0.060". The single shell is then cut to size 4" x 4" overall and two shells are cemented back to back to form the unit as used. Outside dimensions of the single shell are 4" x 4" at lip including 1/8" wide flange, 3½" x 3½" back, 13/32" depth; cemented unit thickness 0.80". Edges of shell are smoothed on a buffing wheel.

TABLE I

No.	Material	O_2 Tr. cc(S.T.P.)/100 Sq. Ins./Day/atm.					
		Dry Pack Exposed at			Wet Pack Exposed at			Wet Pack Exposed in Refrigerator at 39°F. & O_2 76-86 %R.H.
		°F.	%R.H.	O_2	°F.	%R.H.	O_2	
1.	300 MSAT-86							13.0
2.	450 K202				75	24	3.7	2.9
3.	"Mylar" 1-mil				76	23	6.8	6.5
4.	Pliofilm 120 N 2				76	23	14.7	
5.	Pliofilm 140 N 2				76	23	12.3	
6.	Polyethylene, Mfr. A, 1.5 mil	76	20	4.63				
	A, 2.0 "				76	20	257.	
	B, 2.0 "							96.
	C, 2.0 "							61.
	C, 2.1 "							56.
	C, 3.4 "							36.
7.	Spl.Coated 200 Poly							1.0-1.8
8.	300 Cello C/1/S /200 Poly*	78	54	2.1	78	54	3.2	5.5
9.	300 Cello C/2/S /200 Poly*							2.7
10.	Spl.Coated 300 Cello/200 Poly*	78	54	2.1	78	54	2.0	1.5
11.	300 Cello/200 Poly	85	47	1.2	86	50	3.4-6.0	3.2-5.5
		75	25	0.2	75	51	1.6	
12.	Spl.Coated 300 Cello/200 Poly	85-90	48	0.9	85	48	1.6	1.2
					75	45	1.5	
13.	300 Spl.Cello/ 200 Poly	85	50	0.7	85	50	0.9	0.16-0.21
14.	300 Spl.Cello/ 150 Poly				75	23	0.78	0.22
15.	450 Spl.Cello/ 200 Poly	85	47	0.6	87	48	0.32	0.18-0.20
16.	450 Spl.Cello/ 140 N 2	75	70	0.42				
		76	42	0.25				
		39	81	0.08				
17.	50 "Mylar"/ 100 Poly				75	24	4.7	2.75
18.	50 "Mylar"/ 200 Poly*	74	26	1.7	75	26	1.6	0.51
		75	70	2.2	75	70	1.8	
19.	50 "Mylar"/ 200 Poly				80-85	53	6.37	2.4
					76	27	5.7	
20.	50 "Mylar"/ 200 Poly	75-80	25-30	6.7	75-80	25-30	5.8	1.9
	(Boilable Pouch)	75-80	70	5.5	75-80	70	5.0	
21.	50 "Mylar"Spl.Coated/150 Poly (VCA-172 Material)	75	25	0.9-1.3	75	27	0.6-1.0	0.19-0.32
22.	50 "Mylar" Spl. Coated/200 Poly							0.9
23.	100 "Mylar"/ 200 Poly				76	27	3.3	1.45
24.	35 "Mylar"Spl.Coated/150 Poly	75	26	1.37	75	27	1.15	0.45
25.	25 "Mylar"Spl.Coated/150 Poly	74	26	2.14	75	26	1.41	0.53
26.	Spl.Coated Cello 300/	76	27	0.1-.30				
	120 P4 Pliofilm	75	70	7.4				
27.	40 N1 Pliofilm/ 450 Cellc	76	27	0.2-.40				
	/120 P4 Pliofilm	75	70	0.35				

TABLE II

No.	Material	CO_2 Tr. cc(S.T.P.)/100 Sq. Ins./Day/atm.						
		Dry Pack Exposed at			Wet Pack Exposed at			Wet Pack Exposed in Refrigerator at 39°F. & CO_2 76-86 %R.H.
		°F.	%R.H.	CO_2	°F.	%R.H.	CO_2	
3.	"Mylar" 1-mil	77	70	34	77	26	38	
					75	70	40	
5.	Pliofilm 140 N 2	77	30	65	77	33	72	
		75	70	57	75	70	61	
6.	Polyethylene, Mfr. A, 2.O mil	77	29	1539	77	28	872	
		77	70	1035	75	70	982	
8.	300 Cello C/1/S/200 Poly*							151
9.	300 Cello C/2/S/200 Poly*							160-189
11.	300 Cello/ 200 Poly							89-117
12.	Spl. Coated 300 Cello/200 Poly							43
15.	450 Spl. Cello/ 200 Poly							38
19.	50 "Mylar"/ 200 Poly							65
21.	50 "Mylar" Spl. Coated/150 Poly (VCA-172 Material)							43-49
23.	100 "Mylar"/ 200 Poly							58

Legend: * Coated Polyethylene

Also found suitable as a shell was the styrene plastic coaster to be found in most 5 & 10c stores. These are saucer-shaped and have dimensions approximately 3-15/16″ diameter at the lip, 2¾″ diameter back, by 7/16″ overall depth. The small overflow mark on rim should be filed smooth to prevent pinholing the pouch. Two of these coasters are cemented back to back (or bottom to bottom) to form the single shell (See Fig. 3).

Bag size

A standard bag size is used. (1) 6″ x 7″ overall plus 3/16″ lip (⅜″ side seals, ⅛″ bottom seal) for the 4″ x 4″ shell.

After the nitrogen pack is made on the #6-9 Flex-Vac machine, top is resealed on a Sentinel heat sealer, bottom of sealing bar 1¼″ from outer edge of lip. This gives a transmission area of 61.0 sq. in. (2) 5½″ x 6½″ overall plus 3/16″ lip (⅜″ side seals, ⅛″ bottom seal) for the 2¾″ diam. plastic shell. After the nitrogen pack is made, top is resealed 1¼″ from outer edge of lip to give a transmission area of 50.46 sq. in.

Gas packing on #6-9 Flex-Vac machine

A Linde nitrogen tank is connected with the machine. All pouches are packed using left head of machine for uniformity and at gauge pressure of about 60 lb. With the shell inserted in the bag, pressure is selected which will give minimum distortion, that is, neither a puffed appearance, nor a tight cling, since either condition will cause a change in volume. If a surge tank is connected with the machine, a lower pressure is used, possibly as low as 10 lb., but the setting is determined as above.

Water is added prior to gas packing if a wet atmosphere is desired. Conditions may be as follows:

1. Nitrogen
   a) Room temperature and room humidity.
   b) Controlled temperature and R.H.
   c) Refrigerator at 38 — 40°F. and 76 — 86% R.H.
2. Nitrogen plus water (5 drops)
   c) Refrigerator at 38 — 40°F. and 76 — 86% R.H.
3. Nitrogen plus water (2 cc.)
   a) Room temperature and room humidity.
   b) Controlled temperature and R.H.

Sampling for gas composition

It is desirable to prepare 8 — 10 units for each exposure condition. Duplicate samples are analyzed immediately, and thereafter at stated intervals, for oxygen on the Beckman analyzer, or optionally by using Orsat apparatus. The package is punctured by a hypodermic needle through a small cemented rubber patch cut approximately ½″ x ¾″ (Soft Pure Rubber Sheeting, Cat. #R9100, Scientific Glass Apparatus Co., Bloomfield, N.J.) and applied to one face at a spot just inside the shell perimeter. In this location the film is smooth for attaching a non-wrinkled patch, and the shell prevents any likelihood of needle puncturing opposite side. If close checks are not obtained (possibly due to errors in manipulation or a pinholed pouch when sealing), a third sample is taken.

Experience with running materials of known construction as to possible low or high permeability rate will determine the frequency of sampling that may be daily, semi-weekly, weekly, or at 15-day intervals.

Duration of the test for laminated materials of low oxygen-permeability is from 20 to 30 days which, on first thought, might be considered as too long a time to acquire the data. But the time interval is necessary to show when equilibrium is reached, or that the rate is fairly constant. This is particularly true when cellophane is one of the films in the assembly exposed to a wet atmosphere when the rate over various time-intervals will show whether the cellophane or any special coating has reached equilibrium. The latter cannot be obtained in any 4 or 7 days. The longer time interval also gives opportunity of rating the material on appearance throughout the interval.

The principal factors affecting the accuracy of the measurements are the volume of the pouch when gas packed and the accuracy of the gas analysis. The Beckman analyzer requires a volume of 20 cc. and may be read to 0.05 per cent or 1 per cent of full scale. On a pouch of 222 cc. (S.T.P.) volume, this is equal to 0.11 cc. If volume under gas packing should vary as much as 15 cc., the error in rate is about 7 per cent.

Free gas-space volume of pouch

A rubber patch is cemented near one corner of pouch containing the shell which is then put in a beaker of water at room temperature and held submerged by the weight of a second smaller beaker. The pouch is punctured in the area of the patch with a hypodermic needle on one end of a rubber tube connected to a gas burette in which volume is measured. Depending on size of burette, several passes may be required to obtain the total volume. Last small amount of gas is removed from the pouch by water displacement. This is done by making a second puncture at bottom of pouch and allowing water to enter. Remaining gas in the pouch is worked to the top corner under the patch by tilting where it can be removed through the needle.

Measuring the volume under water permits observation of any leakage through pinholes or at the patch, which is not possible if done in air. Procedure is repeated if any leakage is noted.

Temperature and barometer readings are taken and the volume is corrected to standard conditions of temperature and pressure (0°C. and 760 mm. Hg.). In case of added water, correction is also made for the tension of aqueous vapor.

Calculations

Calculations are simplified if the average driving force across the sheet is considered as being equal to the arithmetic mean of the initial and final driving forces. This method has been used by Landrock and Proctor (7), Isherwood (6), and Simril and Hershberger (10). Isherwood is specific in noting that the formula is approximately correct so long as the concentration of oxygen does not rise above 5 — 6%. It is also our observation the same range holds in oxygen determinations of pouches exposed to air.

The equation for calculating the oxygen permeability is as follows:

$$R = \frac{(V)\ (B-C)\ (100)}{(A)\ (T)\left[\frac{(P-C)+(P-B)}{2}\right]} = \frac{(V)\ (B-C)\ (100)\ (2)}{(A)\ (T)\ (2P-C-B)} \text{ or, } = \frac{(V)\ (B-C)\ (100)}{(A)\ (T)\ \left(P-\frac{(C+B)}{2}\right)}$$

Where R = Permeability to 0_2 expressed as cc./100 sq. in./day/atm.
A = Area, sq. in.
B = Percent 0_2, final concentration
C = Percent 0_2, initial concentration
P = Percent 0_2 of atmosphere (partial pressure)
T = Test time in days
V = Total gas volume inside pouch in cc. (S.T.P.)

When the analysis shows a concentration greater than 5 per cent, transmission is calculated according to the logarithmic formula by Cartwright (2):

$$1_n\,(P-C) - 1_n\,(P-B) = \frac{R}{V}\ \frac{(A)\ (T)}{100}$$

Where P = External 0_2 pressure in atmospheres
C = Initial partial pressure in atmospheres in the package
B = Final partial pressure in atmospheres in the package

Example of data and calculations

Mark	38			
Conditions	Dry N_2 pack; exposed at 75°F. & 70% R.H.			
Days	0	15.15	22.18	29.
% 0_2	0.125	5.3	7.35	8.7
Area, sq. in.	61.			
Vol. cc. (S.T.P.)	234.			
0_2 TR.		7.20	7.39	7.04
Corr. for room R.H.		7.39	7.57	7.21

After 15.15 days

B = 5.30%
C = 0.125
B — C = 5.175
T = 15.15
A = 61.
V = 234 x 0.05175 = 12.11

$$R = \frac{12.11 \times 200}{61 \times 15.15 \times \left[2(0.209) - 0.00125 - 0.053\right]} = 7.20 \times \frac{1}{0.9765} = 7.38$$

Correction for atmospheric R.H. :
T.A.V. (tension aqueous vapor) at 75°F. = 22.25 mm. Hg.

$$\text{Vol. \%} = \frac{22.25 \times 100}{760} = 2.05\ ;\ \frac{100 - 2.05}{100} = 0.9765$$

After 29 days

P — C = 0.209 — 0.00125 = 0.20775 ; 1_n = –1.5718
P — B = 0.209 — 0.087 = 0.1220 ; 1_n = –2.104
T = 29
A = 61
V = 234

$$R = \frac{234 \times 100 \times (-1.5718) - (-2.104)}{61 \times 29} = \frac{23400\ (1.5322)}{1769} = 7.04$$

Correction factors for water vapor cancel out when the relative humidity is the same on both sides. At exposure conditions in refrigerator, the correction for all practical purposes may be omitted since the result is seldom affected more than 0.05 cc.

Tests have been made which indicate that the method is also applicable for carbon dioxide transmission. For this determination, a gas mixture of 75% nitrogen and 25% oxygen has been used. Gas packing of the pouch and subsequent handling is the same as under oxygen except that, because of the much higher transmission rate of carbon dioxide, samples are taken after 6, 18, and 24 hours in the case of a highly permeable material like polyethylene; daily up to 4 and 6 days for less permeable or laminated materials, or until a constant rate has been reached. Analysis is made by Orsat apparatus.

Results obtained for various materials by the pouch method using dry and wet pack, and under several exposure conditions as to temperature and relative humidity, are given in Table I, Oxygen Transmission, and Table II, Carbon Dioxide.

Conclusions

The data of Table I for the permeability of oxygen through various flexible materials show the effect of temperature and humidity on the rate of transmission, and the importance of obtaining values indicative of commercial exposure conditions rather than depending on the rate obtained from a sheet or pouch determined at room temperature and dry gas for an entirely different set of requirements.

The method described in this paper has been in use for two years. Good agreement of results has also been found on running a particular construction at widely separated intervals, or on different commercial runs of the same construction.

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(Continued on Page 54)

Peter D. Jacobs has been associated with Consolidated Food Processors, Inc. and its predecessor companies since his graduation from Monmouth College with a B.S. degree in biology. Before becoming manager of the West Chicago plant he served in various capacities, both in quality control and in plant operations, in various plants in the company. He is a member of the Institute of Food Technologists.

T. O. Marziani has been associated with Consolidated for ten years. Before that time, he gained his technical education in West Chicago and Crane Technical High School, Chicago. Starting out "on the line," he has held a sequence of positions in the plant, prior to becoming production superintendent.

Because of the ingredients and materials with which it works, a pickle production plant faces more acute corrosion problems than do many other plants. As a result, its experience in the protection of packaging machinery against corrosion is of particular value. In this article, Mr. Jacobs and Mr. Marziani focus attention on the difficulties contributing to the corrosion problem and outline a number of practical steps that help solve it.

Protecting packaging machinery against corrosion

By Peter D. Jacobs,
Plant Manager,
and Thomas O. Marziani,
Production Superintendent,
Consolidated Food Processors, Inc.,
West Chicago, Illinois

The care we give our packaging machinery and equipment is all that stands between the effects of corrosion and the efficiency and maintenance of our equipment. Since our plant produces pickles the problem of corrosion is present all of the time, and our conditions of corrosion are more severe than those present in many other plants. This is due largely to the brines and syrups with which we work. Typically, each jar of pickles (in addition to the solids) contains either an acidified syrup or an acidified brine. Other plants, both in and out of the field of food, have somewhat similar problems, but our experience may serve to emphasize the difficulties — and what we are doing about them.

Because of the volatile nature of the vinegar and other materials with which we work, corrosion is always in the air. Difficulties involving vinegar are aggravated when the material is heated or agitated. As a result, we have these problems with us, since we circulate the material in the course of curing.

In addition, we have the problems inherent with moisture. Our various uses of water, including that found in our steam pasteurizer, contribute further to a corrosive atmosphere. These factors keep us on our toes to minimize their effect on our machinery and equipment.

We in the pickle industry have had many suggestions about taking the corrosive atmosphere out of our plant. But since a wholesale transfer of the atmosphere would involve an unrealistic investment in equipment and facilities, we are doing the next best thing and are making some practical compromises aimed at minimizing the damage due to corrosion.

Keep Vinegar Apart

A starting point is to keep the concentrated use of vinegar away from our packaging operation. We confine it to its own room in our plant and find that the mere presence of the one wall separating it from our packaging line helps cut down the corrosion to which our machinery is exposed. Similarly, we have our desalting in a separate room, away from vulnerable equipment.

Like other plants similarly situated, we find that the use of stainless steel wherever product and containers touch our equipment is very helpful. Hand in hand with our stainless steel goes our liberal use of water as a flushing agent and as a lubricant for moving parts and conveyor chains.

It happens that our strongest solutions are not necessarily the most corrosive. Our syrups and/or cover brines may be with or without sugar. Those without sugar include dill brines, for dill or sour pickles. This is highly corrosive, even though it does not have a high salt or acid content. There is an electrolytic disturbance in such a weak solution. Other liquid mediums include a sweet type containing 30% to 70% sugar. Syrups with sugar are less corrosive than those using only water, vinegar, salt, and spices.

Still another problem involved in our difficulties with corrosion is that of oxidation. In contrast to materials submerged in liquid, those which are wet in various ways and exposed to air are subject to oxidizing.

Water Flushing Important

Confining our discussion to corrosion problems on our packaging line, we want to emphasize the importance of keeping the filling equipment and the filling line conveyor flushed with water. Whether our jars receive a hand or machine fill (using an overflow briner or a filling machine) the problem is similar. Our jars move on a stainless steel table-top conveyor chain. It is important to keep this chain flushed with water during all periods of use. To do this we have a hose that provides a steady drippage of water on the chain.

If we did not do this, the sweet vinegar would impair the movement of the chain components. This would put a drag on the motor and would accelerate the wear of the chain itself, as well as of the motor. This retarding would be in addition to the corrosion taking place. However, fresh clean water serves as a lubricant and prevents this from happening.

Obviously, a major task at the filler is to give it a good washing at the end of each period of use. The routine clean-up we do at the end of a day involves washing it with plain water, without any soap or detergent. Our end-of-the-week clean-up requires steam, water and a detergent — and the use of stainless steel sponges.

Protecting The Filler

A helpful technique for the end of a day is to take the filler off the line, pull out the pistons, submerge them in water, and let them stand overnight. This is a handy shortcut when no clean-up crew is immediately available. By letting these parts stand in water, they are not out in the air and subject to oxidation. However, we stress that this is a practical, day-to-day, expedient and is not a substitute for a thorough clean-up.

It is important to check the paper board washers or discs in the plunger that forces the vinegar into each jar in the course of filling. If these washers or discs are not removed, they start an electrolytic action, which in turn affects the stainless steel. Actually, each such disc is like a pressed ring between two 3/16" stainless steel discs. The paper board becomes saturated with vinegar. These discs are expendable and we replace them regularly.

Our capping machine requires little attention on our part because it is a standard White Cap Company unit, which we lease and which the White organization services periodically. Our job consists of washing the exterior parts and flushing the interior. As our jars move to the capper, they go through a tilting action to drain out enough brine to provide a head space within the jar. Because of a wide range of container sizes and production run lengths, we do a lot of pre-brining and pre-syruping, as well as overflow filling after the jars receive their pickles. As a result, we need to remove liquid so that containers have adequate headspace.

We cannot overemphasize the value of high pressure water for cleaning. This includes hot water for daily clean-up and a weekly scrubbing with stainless steel sponges. We find that the large or industrial size of stainless steel sponge is the best to use for our cleaning work.

Pasteurization And Corrosion

Capped jars go through a pasteurizer. First, however, they are washed with a warm water spray, which precedes their entry into the pasteurizer. The chain of the pasteurizer is stainless steel. In addition to the vulnerability to corrosion due to the presence of steam vapor, another source of corrosion can come from uncapped jars.

As in so many other plants, we find that occasionally an uncapped jar gets through our line and moves into the pasteurizer. We take every precaution to avoid this because the contents of a jar can play havoc with the inside of a pasteurizer. Another

Things to remember about water:

1. As a machinery flushing and cleansing agent it is invaluable and should be used freely where the product being filled involves a corrosive liquid.
2. As a lubricant it is important because moving metal parts passing through a water pan are spared the damaging effect of dry metal-to-metal contact.
3. As a wash it permits quick removal of product run-over on jar exteriors, to assure a clean, uniform surface for labeling.
4. But in vapor form (steam, for example) it may be a source of corrosion to guard against and its presence deserves attention, so that a plant may protect its machinery and its operations (such as labeling) against it.

precaution is to be sure that all jars are thoroughly flushed so that all of the brine or other solution is washed off the exterior surfaces prior to pasteurizing.

Leaving the pasteurizer, jars move to our labeling operation. Usually the side walls are fairly dry by the time the jars get to the labeler, but the bottoms often have moisture on them. Aside from the corrosion problems, the moisture and other sources of humidity make the labeling operation extremely difficult. But from the standpoint of the equipment, our greatest hazard comes from the occasional breaking of a jar. When this happens, the vinegar spills, splashing all over the labeler.

A special problem here is that we cannot spend too much time cleaning our machine after a jar does break. The reason for this is that there is a steady flow of jars emerging from our pasteurizer and we cannot backlog or accumulate these long enough to do a thorough clean-up. As a result, our crew members have to work fast doing a practical and realistic kind of clean-up to get the equipment back in operation.

Lubrication Of Machinery

We have a closed system of lubrication with a central grease gun to distribute lubricants simultaneously to a number of different fittings on our labeler. Because of the cams and cam rollers and the general array of moving parts, it is highly desirable to avoid all metal to metal contact and provide frequent and thorough lubrication of a labeler. Such a central system permits doing it as often as necessary. Obviously our labeler requires more lubrication than other machinery, such as a capper.

We emphasize the importance of adequate washing and water lubrication of the entire conveyor chain serving our packaging line. At various points the chain moves through pans of fresh, clean water. This water does not recirculate. Anyone concerned with protecting machinery against corrosive liquid needs to recognize the value of water as a lubricant.

Not only to minimize corrosion but to facilitate the movement of jars, we use round half-inch stainless steel rods for guide rails. These do not offer the friction that rectangular lengths or strips of steel offer. The cumulative effect of the friction is shown by the fact that even with these round rods we occasionally experience some flattening out due to the repeated contact of containers moving against it.

Because of the materials we work with, we find that an acid-proof asphalt makes a suitable floor for our plant. The different vinegars, as well as plain salt, readily attack concrete, so we cannot use that as a floor.

Protective Maintenance

Since our use of stainless steel is confined to points of contact between product and containers on the various items of equipment, we do have a lot of mild steel. We keep this painted with a top grade of metal enamel and do this as often as necessary, depending on the nature of the exposure involved. We may have to do it every few months. In short, it should be done often enough to provide tough protective coating and to present a desirable appearance.

We realize that there are materials other than stainless steel available for the protection of our equipment and parts against corrosion. Unfortunately, not all of these are in the convenient forms that we find stainless steel. There are so many sheet and bar sizes readily at hand that availability is no problem.

Of course, new materials are constantly appearing and it may be that various plastics will take the place of some metals. Outside of our packaging area we find that wood continues to play a major role in the holding of our product. Some of our holding tanks of wood have been in service for 50 years. No metal could have served similarly.

Oxidation, Temperature

Those having to protect packaging machinery against corrosion need to keep in mind the effect of oxidation. For example, if our pipes are drained and exposed to air, they are vulnerable to corrosion due to oxidation. However, if we keep them fully loaded with product there is no exposure to air and, hence, relatively little oxidation.

It is also helpful to study the relationship of temperature to various water conditions on the packaging line. For example, if we can set up a flow of production for a run and regulate the heat of the pasteurizer, we can get just the right cooling action. We would like to maintain a temperature of 90 degrees F inside each jar emerging from the pasteurizer. Then, by the time the jar reaches the labeler, it should be just about right. However, it is not always possible to hold this 90-degree temperature.

It has been suggested that we do our labeling in a separate room in order to avoid the effects of heat, moisture, and the like, to which our labeling operation otherwise is exposed. However, practical plant conditions preclude isolating our labeler in a separate room. Therefore, we have to adjust our operations to the practicalities of normal running conditions.

Underlying all of our efforts to protect our equipment against corrosion is the importance of establishing daily and weekly routines. These assure adequate cleansing of equipment at all times. Similar protective considerations deserve attention when preparing to paint the equipment. Obviously, a careful brushing-down (with wire brushes) of equipment to remove rust spots is a prerequisite to an adequate painting job. Since we have to use a large amount of mild steel on our line, we think it is important to give it the best maintenance and painting we can to protect it against the corrosive atmosphere in which it operates.

Similar measures elsewhere in our plant receive careful attention. We take like precautions in our processing areas and wherever our materials and ingredients are handled. However, the routines we practice in connection with our packaging lines illustrate our emphasis on adequate clean-up of equipment as an effective means of preventing the damage that inevitably follows corrosion.

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Here is a searching look at some of the unsolved difficulties of the quality control of multiwall bags. In this article Mr. O'Connor reviews tests and practices currently available, and suggests the need of additional tests. His discussion should stimulate the interest of users and suppliers alike in the evolution and refinement of adequate but practical tests.

Problems in the quality control of multiwall bags

By Donal J. O'Connor,
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Chicago

The multiwall bag is an effective, economical package for granular or powdery materials. While not confined to the aforementioned classifications perhaps the multiwall bag is the most common container for products of this nature. Many special and unusual applications have been found for the container, among them being to package molten asphalt and to package rubber.

While the multiwall bag is used in a volume approximating three billion bags per year in this country, it is interesting to note that almost every bag is custom made. The particular bag made is specifically designed around the product and the quantity of that product to be contained.

Given the product and quantity to be packaged, the bag is designed by first borrowing on knowledge gained from packaging similar items, or in lieu of such information, by drop tests, tumble tests and other tests deemed necessary to assure proper protection of the product contained. The laboratory tests are usually followed by test shipments.

Establishing Specifications

Specifications are drawn up on the basis of findings in both the laboratory stage and the test shipment stage. The specifications are extremely important to the purchasing department and the supplier inasmuch as there are so many variables in construction from one bag to another. These variables may be bag size, printing, number of plies, specialty sheets, variations in end closures and a myriad of others based on customer specifications.

The purpose of this article is not to discuss design problems of the multiwall bag, or the use of specialty sheets. We cannot cover our subject, however, without touching on some of the basic design principles and manufacturing techniques.

We wish to discuss here the problems of quality control from the user's standpoint and to show some of the complexities of attempting to maintain the quality that assures excellent performance of the package in the field.

The specification for a particular multiwall bag is arrived at through testing and shipping. The customer's specification will include the following general information: Style of bag, number of plies, basis weight of plies, specialty sheets, printing,

TABLE I

Quality Control — ALL TYPES OF BAGS

A — Overall appearance	Printing for copy and quality
B — Fabrication quality	1. For evidence of excessive draw roll pressure. 2. Nesting of plies. 3. Seam locations (should be staggered and not interlocked.) 4. Seam overlap of all plies (should be 1".) 5. Thumbhole cutout (should be clean cut, no tab remaining).
C — Adhesives used	1. Should cause least possible paper shrinkage. 2. If water-proof adhesives are called for, check them.
D — Special sheets	1. Asphalt should not bleed. 2. Tight bond of polyethylene. 3. Rough side of crepe outer ply should face outside — Quality is determined by amount of shingle. 4. Identification markings for wet strength sheets. 5. Any other special sheets called for.

TABLE II

Quality Control — SEWN BAGS

A — Sewing	Should be 3.0 to 3.6 stitches per inch.
B — Filler cord	Paper or cotton.
C — Thread	Check both needle and looper thread for type, color and number of plies.
D — Tape	Should normally be firmly glued down.
E — Needle holes	Normally ½" in from end of bag (in straight line across entire bag).
F —Resewing by mfgr.	If bag has been resewn, is clearance between sewing lines according to specification?
G — Opening instructions	If called for, and placement.
H — Valve bags	1. Check style of valve. 2. Measure valve size and check dimensions specified. 3. Check position of sleeves, inserts and extensions.
I — Tape ears	Normally ¾" to 1" beyond edge of valve (Excessive length may interfere with valve packer).
J — Spot or bar pasting	Check (if called for) and location.

TABLE III

Quality Control — PASTED BAGS

A — Spot pasting	Check location and quality
B — Bottom dimensions	Check against specification
C — Observe bottom	1. Regular or inverted? (Folded to back of bag or front of bag?) 2. Is bottom pasted squarely? 3. Is bottom tab pasted down properly?
D — Valve bag	1. Check style of valve 2. Measure valve size and check against dimension specified. 3. Tube size and paper overlap at valve and/or bottom. 4. Observe sifting areas and slitter cuts if any 5. Observe shape and position of sleeves, inserts and extensions.

dimensions, packaging and marking. The customer may wish to include such things as colored tape or thread, smoothness of kraft, etc.

In addition, it is understood, when a customer purchases the bag, that it meets the minimum requirements of The Uniform Freight Classification and or Federal Specification UU-S-48. The bag manufacturer places a compliance stamp on every bag (unless otherwise requested) indicating that the bag is guaranteed by him to meet minimum freight classification requirements.

Inspecting Bag Samples

Consider the customer who has placed an order for multiwall bags. The order is shipped to his plant on schedule. On arrival at the customer's plant, the quality control department picks a pre-determined number of bags at random throughout the car. If the samples meet specifications, the lot of bags is accepted and considered of good quality and placed in storage for use. These same bags, however, may show up very poorly when filled and shipped. The user may suddenly find himself buried under a series of complaints due to excessive bag breakage.

Let us consider the specifications and control exercised over incoming shipments. (See accompanying charts) These, by the way, may serve as a quality control guide. All points listed are important. The requirements are basic and the list may be added to for special needs. The charts are broken into three classifications for ready reference. I — all types of bags — since these are points in common to all types; II — sewn bags, and III — pasted bags.

Note that the suggested inspections are visual. To this visual check list a simple test can be added: Checking the basis weight of each ply. Some users then carry the quality control still further to check compliance of the paper with Federal Specification UU-S-48 for tensile and tear requirements. This requires special equipment and a conditioned laboratory. Others may have additional tests to determine smoothness or roughness of paper. Effectiveness of

specialty sheets such as barrier sheets, release coatings, and porosity of paper are also checked.

Use Physical Tests?

Those familiar with multiwall bag problems will probably agree on the need for all but the physical tests. Some feel they are necessary. Others will rely on the physical tests only in the event that trouble develops with a particular lot of bags. This is done by holding out a number of sample bags from each lot. In the event that complaints come in from the field, the samples are then checked for tensile, tear, basis weight and any other tests deemed necessary.

These tests are time consuming and, as a result, quite expensive. At this point we will conclude that the physical tests, and others deemed necessary, will indicate the quality of each of the component plies that go into the manufacture of a multiwall bag.

However, the point we emphasize here is that even on completion of these physical tests, the ability of the bag to perform as a unit is still not fully known. Other factors of bag construction enter into performance that currently are not easily measured.

Let us consider now some of the tests currently in use to measure the performance of the bag as a whole. All of the individual tests mentioned up to this point, of course, are directed toward that end.

Shipping Test Best

The best test is an actual shipping test under the conditions normally prevailing. The main drawback to this method is that a reasonably large number of bags must be shipped under all the varying conditions of and methods of transportation, rehandling, storage, weather conditions and the great number of other variables. Anyone who has attempted to evaluate such a test knows the difficulties of arriving at conclusions.

The shipments must be followed, inspected by trained personnel, and reported on in great detail. Seemingly endless time is involved in gathering, and analyzing all the data collected. Bear in mind that the user does not want to over-pack his product and pay a continued penalty. Therefore as a practical matter we must consider some accelerated form of testing.

Perhaps the test most commonly in use to determine the performance of a multiwall bag is the drop test. There are advantages to the test in that certain elements can be controlled. Height of drop may be controlled, position of the bag may be controlled, and the conditions of moisture and temperature can be controlled. It can, over a large number of tests, give an indication of how well the bag performs.

Any group of test bags varying a great deal from the average established may be considered inferior or superior to the average performance. It is also possible with the drop test to generally confine the area of bag failure by choosing the point on which the bag falls. A gusset drop will generally cause failure at the sewn end of a bag. A butt drop may be expected to cause gusset failure and a face drop damage to the body of the bag.

Drop Test Difficulties

Any reader who has conducted drop tests has encountered one or several bags in a test group that appear to be far superior to the others in the group, or considerably poorer. It is not uncommon to find most bags in a test group breaking at 10 or 12 drops, then suddenly find a bag breaking at four drops or, on the other hand, one that breaks at 20 drops.

On failure it is extremely difficult to determine why the particular bag performed as it did. The evidence is destroyed. That which remains cannot be measured by tensile or tear test since the characteristics of the paper have changed due to stresses exerted by handling.

Another weakness of the drop test is the inability of supplier and customer to duplicate test results. Results of the tests can be changed by changing test crews. Using the same drop test equipment means little when one installation has 6 inches of concrete floor under the drop tester and another has 18 inches of concrete under the equipment.

Still another weakness the writer has noted in drop test laboratories is the poor method of loading and closing sewn open mouth bags. Bags are abused in filling, pouring from one bag into another, lifting the bag to the sewing head by rolling the end of the bag and grasping, sewing the closure when the sewing head and conveyor are not synchronized.

One final weakness of the drop test is that, prior to drop testing bags, nothing is known about how well the bag is made. Of special interest is how well the plies work together. For optimum performance all plies in the bag should work together. If there were a way to determine how well the plies were nested prior to drop testing, the erratic performance of drop tests and irregular performance of bags in the field might be answered.

What Caused Gusset Failure?

Before pursuing this thought any further the writer would like to draw on an experience that would point up the problems involved. A shipment of bags was received that appeared in all respects to be of good quality. Suddenly a large number of breakage claims appeared in the area serviced by one plant. From this same order of bags a shipment was made to another plant.

Breakage reports started coming in from the area serviced by the second plant. The only information immediately available was that all the bags were made by the same supplier.

Immediately, samples of unused bags were tested for tensile and basic weight. Nothing showed up until some of the damaged bags were received. Most failures were in the gusset.

Closer examination of unused bags showed borderline nesting and apparent excessive draw roll pressure. Under a magnifying glass the fibers appeared broken at the center fold of the gusset. The bags were admitted to be sub-standard, but it was never proven to the writer's satisfaction whether the poor nesting or the excessive draw roll pressure was the cause.

This might have been proven by taking five sample bags and testing

the tensile strength at the gussets. From each bag at least five samples would have to be taken for an average. The bag was a four-ply bag and it would be necessary to test the tensile strength of each gusset and the area between (to determine the strength of the sheet unfolded). If the reader has calculated the number tests, he will find that 300 tensile tests would have been conducted to determine paper strength at the fold.

Fabrication Affects Performance

In a previous paragraph it was stated that for optimum performance it is necessary for all plies to work together. The relationship of how well all plies of the bag fit together is called nesting. Let us first consider some of the mechanics of bag making that contribute to bag performance. For simplicity's sake consider a two-ply bag:

This would immediately indicate that two rolls of paper are fed into the tuber. As the name would indicate, the paper is brought into the machine in such a manner that the outer edges of the paper web are folded toward the center. Adhesive is applied and the edges joined in such a manner as to form a tube. This forms the seam of the bag. Seams are made in such a manner that on each succeeding ply the seam is staggered.

Imagine a two-ply bag with the two plies in contact at all points. Cut a one-inch strip across the face of the bag in such a manner that you will have a ring of paper one inch wide and two layers thick. Obviously if you were to attempt to pull the ring apart it would be harder to pull this assembly apart than one made of a single ring.

Consider the same two-ply bag construction except that for some reason there was one-half inch of space between the inner and outer ply. A one-inch strip cut from this bag would also give a double ring, but there would be a space between the two rings. To pull this assembly apart would take no more strength than to break a single ring of paper. If you were to perform such a test on a good four- or five-ply bag, you would seldom find more than two plies breaking together. Factors contributing to this phenomenon are dimensional instability of paper and variation in the percent stretch of paper.

One other function of the tuber is to form folds or gussets. The paper must be pulled through the machine and this is accomplished by a set of rotating steel rollers. If they should ride directly on the folds of the paper, excessive pressure exerted in that area could put sharp creases in the paper and tend to break the paper fibers thereby weakening the bag at this point.

Examine Paper Properties

We have considered some of the fabricating factors that affect bag performance. Now let us consider some of the paper properties that affect the finished bag.

Many modern kraft paper mills are making kraft paper on 200-inch paper machines. Looking across one of these machines (front to back) the observer would see a continuous web of paper coming off the machine. The paper looks the same all across the machine. If one were to run a test to determine the percent stretch in the paper, he would find it to differ in different areas across the machine.

If the machine were making kraft paper for a large order of multiwall bags that were to be 20 inches wide with a 4½ in. gusset and a one-inch glue lap allowance, you could trim the machine to four 50-inch rolls. To identify the rolls, letter them A, B, C & D. Each roll could conceivably be one ply of the bag.

On testing the paper it might be found that roll A had 3½% stretch on cross machine direction while roll C had 5% stretch in the same direction. On impact the 50-inch sheet of paper with 3½% stretch could stretch 1.75" while that with 2% stretch could stretch only 1". This would account for plies not breaking together in the tensile test outlined above.

Moisture Percentage Problems

Another property of paper affecting multiwall bag performance is the percent moisture in the paper at the time the bag is manufactured. It is quite possible that when a bag is made one ply of paper has 6% moisture while another has 8% or more. It is possible that all plies could be different from the standpoint of moisture content when the bag is made.

In storage all plies will tend to equalize in moisture content. Some may lose moisture and shrink while others gain and expand. It is obvious what happens to the nesting of plies under these conditions or how well they work together under stresses of handling.

The writer has endeavored to show the complexity of evaluating the multiwall bag. Any user of this packaging form will agree that it is quite satisfactory from the performance standpoint. Quality of the package is accepted as generally high. The feeling of uncertainty about existing control methods is no reflection on the package or the suppliers of the package.

Instances of large damage claims attributable to package failure are exceptional. Both supplier and user are equally concerned about package failure and go to great pains to maintain quality. Being aware of the shortcomings in current methods of evaluation, all users and suppliers of the multiwall bag should be devoting their energies toward developing a test that is, first of all, indicative of the physical strength of the finished bag. It is also highly desirable that the method be simple, reproducible and require a minimum of time.

Have you a check list?

Aside from Mr. O'Connor's significant observations on the need for more tests as a phase of multiwall bag quality control, he also provides a helpful check list — on Page 30. The points he lists should help anyone whose work includes bag inspection and evaluation.

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James R. Fellows joined the Mikesell organization 21 years ago in a sales capacity after receiving his education in Detroit. He has worked in every phase of the business and has participated in all jobs from potato peeling to general management. During World War II he was a field service representative for the Aero Products Division of General Motors. Following the war he returned to the Mikesell organization. He is a director of the National Potato Chip Institute and is a past president of this organization's North Central regional group.

Moving into a new single story plant presented Daniel W. Mikesell, Inc., the problem of providing an easy system of conveying empty shipping containers. To deliver these to points within easy reach of those on the packaging lines, the company hit on the idea of a continuously moving overhead conveyor. This article tells how the management and technicians of the Mikesell organization worked out this conveyor and how it is fitting into their operation.

Overhead delivery of empty shipping containers

By James R. Fellows,
Vice President — Production and Sales,
Daniel W. Mikesell, Inc.,
Dayton, Ohio

As soon as we set up our packaging lines in our new plant, we saw that one of our first needs would be a means of delivering empty corrugated shipping containers to the people on our packaging line. We receive these containers from our suppliers flat and in bundles and we staple them for use in our plant. Thus, our problem became that of getting the stapled containers from the stapling operation to various points from which the packers could take them for loading. Further, we wanted to do this with minimum motion and without crossing any aisles.

After hitting on the idea of using an overhead conveyor to move our cases, we sketched out our plans and called in our supplier — who recommended and furnished a Landahl chainless conveyor. To this conveyor we have added our own arrangement of hooks on which the cases hang while riding to the various points of use.

Conveyor Details

We now have 180′ of conveyor traveling 900′ an hour with 90 hangers spaced 2′ apart. Our speed of 900′ an hour means that 450 cases go past any given point each hour. An important feature of our system is that packers wishing to use cases merely take them off the hooks of the moving conveyor. If they do not need any or if no one is available to take cases off, these cases merely continue riding on the endless conveyor. As a result, there is no stacking or accumulating of empty cases in our packaging areas.

As a phase of this project we moved our stapling operation to one end of our finished goods storage area — just off the loading dock where new supplies of empty cases arrive. Now a delivery truck simply stops at this platform and our crews set up sections of gravity conveyor in the truck bodies to convey the bundles of cases to the stapling point.

One Man Handles Cases

With the new operation we have

These fork-like prongs attached to the moving conveyor carry empty corrugated shipping containers from the supply point to the packaging lines. Hangers are designed to hold two sizes of containers which the plant uses and they are inclined so cases do not fall off.

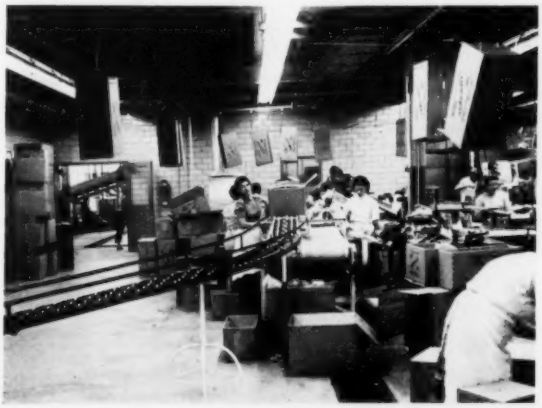
Packaging line attendants remove cases as needed. Use of this conveyor makes unnecessary the stacking of large quantities of empty cases prior to their being loaded. Conveyor carries cases sufficiently high above floor level to avoid impeding use of space on floor beneath it.

Moving through wall opening the Landahl chainless conveyor has an endless movement. Cases not taken off in the packaging room move right on around with the conveyor, thus not piling up on floor. It has 90 hangers spaced 2′ apart each and it runs at a speed of 900′ an hour.

Important feature of this conveyor is that it moves through the packaging room, passing all of the points where cases are needed. Unless a girl removes a case from a hanger, it keeps on riding around with the endless conveyor. The entire conveyor installation uses 180′ of travel.

just one man setting up and stapling cases on our Acme Steel unit and loading the overhead conveyor. Before installing the present operation we had one man making up cases and three people carrying them back and forth to the points of use. Also, there was an excessive amount of movement and the crossing of aisles back and forth. Similarly, the return of cases from our own trucks had to be carried out from the loading dock.

A feature of our operation is that many of these cases are reused repeatedly. In short, we use them for as many trips as the life of a case permits — for delivering individual packages of potato chips to our dealers. Thus, not only the newly stapled



As cases are filled, they move away from packaging room on a gravity conveyor leading to a powered conveyor going to the stock room. Cases riding on overhead conveyor in background are empty. Not having been removed by line attendants, they move around until they are needed.

This is

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cases but also those used on their second and succeeding trips arrive at the single point where an attendant loads the conveyor.

This conveyor is arranged so that it passes each point where packaging takes place and at the same time keeps out of the way of our popcorn line, which is located in the center of the packaging room. Also, the conveyor is high enough and sufficiently out of the way so that it does not interfere with operations and movements within the packaging area.

Use Of Hangers

Our own plant produced the hangers we are using with this conveyor. Each one consists of four hooks or arms. We have two principal case sizes and the wider of the two uses all four arms while hanging on the conveyor. The smaller case uses just two of them. These arms are angled slightly upward so that cases do not fall off while in movement. In other words, they are something like pitchforks with straight prongs. We are still evolving a proper hook or hanger design and expect to go through more experimentation before reaching what we regard as the final model. The present arrangement does serve the purpose, however.

Could Handle More Cases

All that the attendant in the finished goods area does in regard to case movement is to place the cases on the hangers. Riding on this conveyor they pass through wall openings and reach the packaging area. Here the packers merely lift them off the hooks. Conceivably we could have pairs of cases ride side by side by modifying our hanger and hook design. In fact, we could carry two, three, or even six cases on each. Our only problem would be the enlargement of our wall openings. An advantage of our system is that we can use any case sizes desired, there being no conveyor or dimensional adjustments to make.

In the packaging room the packers merely load the cases and place them on a gravity conveyor. This leads to a powered conveyor going into the stock room where finished work stands pending shipment from our plant.

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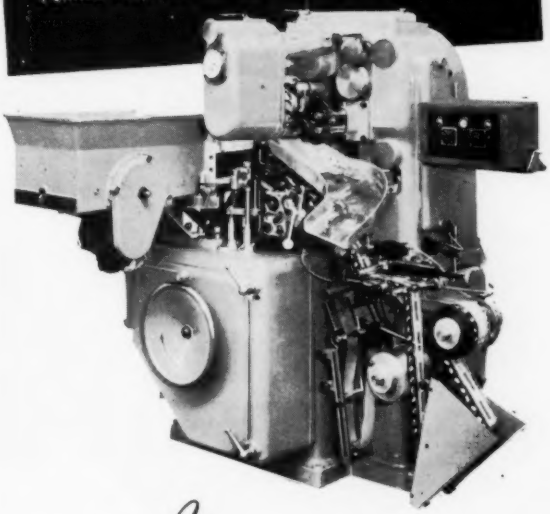

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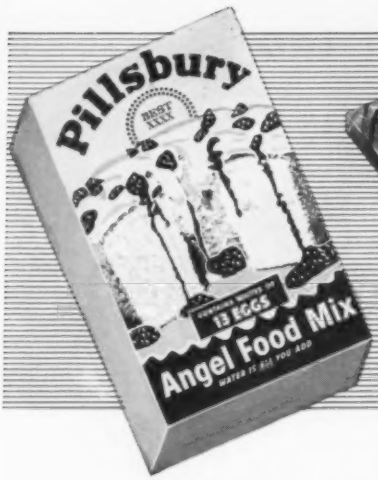

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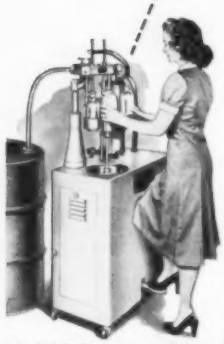

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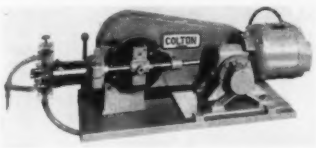
Liquid Fillers

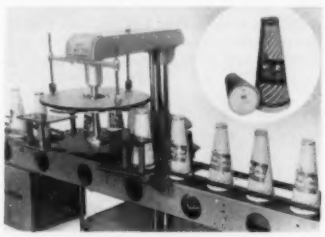
Arthur Colton Co. has new Little Giant single and twin-nozzle models of liquid fillers. Designed primarily



for low volume manufacturers and for small lots, the machines can handle liquids from alcohol to cream oil consistencies, filling both glass or plastic bottles, jars and cans. Model 117, a single-metering cylinder, single nozzle, has a total fill capacity of 8 fluid oz. and will fill up to 40 containers per minute. Model 119 is a double-metering cylinder, double nozzle, has a total maximum fill capacity of 8 fluid oz. from each nozzle and a top filling speed of 80 containers per minute. Models can be bench mounted. Circle No. 1.

Imprinting Attachment

Adolph Gottscho, Inc. announces a new imprinting attachment which imprints code-dates on the bottom of



waxed, tapered paper containers on conveyorized production lines. Designed for attachment to any existing conveyor line, the imprinter can operate at speeds up to 600 impressions per minute, whether product flow is regular or intermittent. This machine makes imprints from rubber type and suitably formulated fast-drying liquid inks even on heavily waxed surfaces. Code-marks can be changed by substituting adhesive-backed pieces of type on type-wheel. The machine is portable. Circle No. 2.

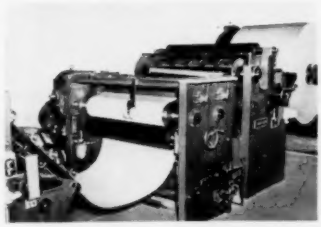
Duplex Lubricator

Bijur Lubricating Corp. reports a single automatic lubricator which provides two independent lubrication

systems, providing both cyclic and continuous oil flow to different bearings on the same machine. This AP-3 lubricator is designed for use on machines with a dual lubrication problem, where some bearings need periodic lubrication, and others require oil continuously. Cyclic pressures can be as high as 150 psi., as low as 25 psi. Pressure periods, or cycles, range from every 5 to every 30 minutes. Circle No. 3.

Automatic Butt Splicer

Champlain Co. announces its automatic butt splicer for automatic splicing of a new web onto an expiring web while web is running at top speed. The unit is designed for in-line operation with roll-fed presses. Its operation includes synchronizing the speed of the new web with that of the expiring web, simultaneous cutting of both, ejecting waste material, and butt-splicing the two webs with pressure-sensitive tape. Machine operates at press speeds up to 300 fpm., and will handle any width of paper board. Available in three sizes, 26″, 36″, and 44″, the splicer requires no



reservoir or extended web loop and no special web storage facilities. Circle No. 4.

End Stapler

The International Staple and Machine Co. has a new end stapler for stapling all kinds of end-open cartons. The

unit has a simple, two-cycle air motor and an all-mechanical trip. The head can be rotated a full 90 degrees left or right to a positive stop to permit either vertical or horizontal application of the staple. This stapler weighs 70 lbs. Its table is 24″ wide x 19″ long x 31″ high; height 62″ with magazine; length 34″ front to back; staple position 12″ to 15″ above table level. Circle No. 5.

Heat Sealer

Packaging Industries Ltd., Inc. reports its new Pacemaker thermal impulse heat sealer for production heat sealing of packaging films such as

Portable CODE-DATING MACHINE attaches to *any* production-line

requires no alteration of existing set-up

Fully automatic packaging-line imprinting machine places codes, other changeable legends on *bottom* of jars, bottles, cans, etc. Makes clean, sharp, uniform impressions consistently—regardless of whether container surface is flat or concave, flush or recessed. Designed for quick copy changes, easy cleanup. Offers all the advantages of a fixed-installation imprinter without disadvantage of changing present operation.

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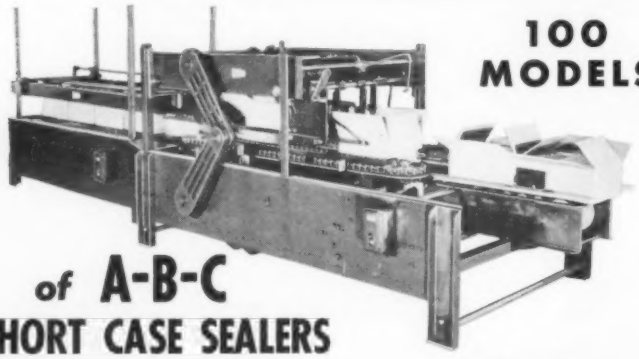
For more information circle No. 226 on Reader Service Card

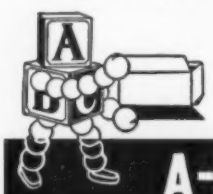


100 MODELS of A-B-C SHORT CASE SEALERS

Save two-thirds of your valuable floor space with the A-B-C Short Case Sealer—with increased packaging efficiency, more speed, less expense . . . Automatically glues, folds and seals either or both top and bottom flaps of shipping cases in one operation. Made in eight models to fit any production requirement. Hot air heaters dry the glue in one-half the time. Speeds up to 30 cases per minute.

TOP QUALITY CASE HANDLING EQUIPMENT

Whatever your packaging job, A-B-C has a production proved machine for you—case sealers, unloaders and unscramblers, side sealers, and hand gluers.



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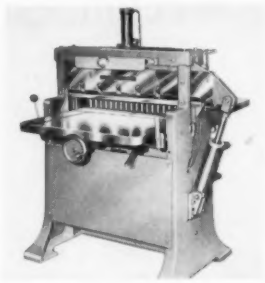
TARPON SPRINGS, FLORIDA

For more information circle No. 227 on Reader Service Card

polyethylene, Mylar, Pliofilm, vinyl, saran, etc. This unit features close control over the heating and cooling times by electrical timers. The machine is currently available in four sizes, 9″, 13″, 25″, and 45″ (effective sealing area), either hand or foot-pedal operated. Circle No. 6.

Power, Lever Cutters

Challenge Machinery Co. announces its new H models of power and lever cuttters. The series features faster



knife action, simplified knife changing, automatic knife bar return, and a special safety control. This control requires both hands on the controls throughout the entire cutting cycle. If either hand is released, the blade stops instantly. Available in 19″, 23″, 26″ and 30″ sizes, the 26″ and 30″ sizes have a cutting rate of approximately 28 cuts per minute. Circle No. 7.

Chemically Inert Film

Shamban Engineering Co. reports a new film, Califilm, a tough, non-porous film which is clear, colorless and transparent in its natural state. Without brittleness at low temperatures, it is inert to organic and mineral acids. It may be RF or heat sealed by conventional techniques. Noncarbonizing, the film gives positive insulation for resistors, solenoids, condensors, transformers, motors, and generators. The film has non-wetting qualities and resistance to fungus and hydraulic shock. Useful temperatures range from —120 degrees F to 390 degrees F. Circle No. 8.

Plastic Tap Cork

Armstrong Cork Co., Glass and Closure Div., has a new type of plastic tap cork that, Armstrong says, seals

better than natural cork, but costs less. This Armstrong polyethylene tap cork achieves a tight seal under

pressure of carbonation through the use of a collar. The collar "gives" during insertion into the keg orifice, then snaps against the underside of the bushing. The company says the corks are easy to use and can result in loss being cut to a minimum. Circle No. 9.

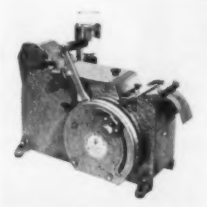
Bench Scale

The Douglas Homs Company announces new all-steel full capacity beam bench scales. Readily portable,

the units have sharp, clear weight graduations and numbers on electro-oxidized beams. They are designed to eliminate the use of loose counter weights. A locking device permits use of the beam as a carrying handle. All operating parts are in front and below scale platform. Units are available with adjustable tare bars. Circle No. 10.

Tape Dispenser That Imprints

Better Packages, Inc. has a new Code Taper #2 which imprints information directly on sealing tape, during



the exact interval when tape is being discharged by the dispenser. The machine requires just one feed stroke to measure, moisten, dispense, cut and code tape, and uses rubber type which is easily changed. Available for printing 3" tape, it may be adjusted for printing 1½", 2", or 2½" widths, either from type or printing mats. Circle No. 11.

Manual Label Gluers

King Sales and Engineering Co. reports development of its improved 6" and 9" model F manual label gluers. The gluers are designed for any manual production gluing with labels, shipping tags, package sealers, mailers, etc. The gluers use the direct drive principle, eliminating pulleys, belts, and worm gears, and the flexible-play coupling, which eliminates strain on shaft and bearings. Gluer unit lifts off the gearhead base without tools for cleaning. Circle No. 12.

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Laminated Packaging

Dobeckmun Co. offers its product announcement report No. 11 covering its packaging materials developed for such products as soft drink and lemonade mixes. It gives the details and weights of materials involved, as well as their costs and reason for their particular use. Specific materials and laminations are enumerated. Circle No. 101.

Portable Bag Closure

Dave Fischbein Co. has a four-page folder describing its portable bag closure, designed to close an average 100-lb. bag in less than 6 seconds. Photos show detailed use of this 10½-lb. unit, which handles textile and paper bags, and which has a stitch range of 4 to 5½ stitches per inch. Circle No. 102.

Cost Reduction Details

Hinde & Dauch offers booklet No. 4 of its Little Packaging Library. This booklet suggests ways of reducing labor costs with corrugated boxes. It tells how to calculate labor cost per package and describes ways of examining a packaging operation — all with an eye to minimizing packaging costs. Circle No. 103.

Automatic Tape Dispenser

Air Fixtures Inc. announces bulletin 656B, describing its air operated pressure-sensitive tape dispenser, a fully-automatic unit for handling filament, glass fibre, cloth, heavy paper, plastic film, cellulose, and acetate fibre tapes. This unit handles tapes up to 4″ wide, lengths up to 21″, and maximum roll diameters of 9″. Circle No. 104.

Filling Machinery

Arthur Colton Co. announces Vol. 1, No. 1 of Colton Comments, a four-page booklet describing new units for multiple liquid filling of bottles, cans, and jars; rotary tableting presses; dust collection equipment; and drying ovens. Photos and tabulations of features and capacities accompany the descriptive text. Circle No. 105.

Polyethylene Resins

E. I. du Pont de Nemours & Co., Inc. announces a booklet on the properties and uses of 13 different compositions of its Alathon polyethylene resin, designed for a wide variety of packaging from chemicals to metal parts. Basic characteristics, outstanding properties, and recommended applications for each of these 13 are enumerated. Details concerning forms available for packaging, as well as uses, also are included. Circle No. 106.

Boxboard Sample Book

Columbia Box Board Mills, Inc. announces a new plastic-bound book containing samples of its Krafibre paperboard. Samples are short-cut to show a variety of colors and each page is silk-screen printed with a different illustration of the various qualities of Krafibre. This book also includes a two-page tabulation of information about boxboard used in packaging, including grade, content, caliper, finish, brightness, and bending qualities. Circle No. 107.

Bulk Packaging

Tri-Wall Containers, Inc. offers a four-page folder illustrating seven basic types of its bulk packs for heavy-duty packaging. Tri-Wall says these packs, made of triple wall corrugated board, have carried skidded loads in excess of 3,000 lbs. This booklet includes details of the tri-wall construction itself. Circle No. 108.

High Density Polyethylene

Spencer Chemical Co. has a two-page bulletin comparing the property data of its new high density polyethylene film vs. that of conventional density. Spencer says this new film can withstand temperatures up to 240 degrees F, has a specific gravity of 0.938, and is stiffer, less permeable, and more greaseproof than conventional polyethylene. The bulletin also notes the tests used in making the comparisons. Circle No. 109.

Packaging Machinery

Peters Machinery Co. has an eight-page catalog of its packaging machinery, including equipment for carton forming and lining, carton folding and closing, and carton and tray forming and gluing. Carton sizes, machine specifications, and installation floor plans are included. These machines range from 30 to 175 or more units a minute. Circle No. 110.

Vacuum Forming, Packaging Machines

Product Packaging Engineering announces a four-page illustrated brochure describing its machines for plastic forming, drape and vacuum forming, contour or skin packaging, and blister and cluster packs. Circle No. 111.

Automatic Packaging Machinery

Mercury Heat Sealing Equipment Co. has a two-page brochure on its Verti-Pak. This unit forms, fills, and seals packages of various materials, ranging from 1½″ to 8″ wide, and 3″ to 10″ long, running at 30 to 50 packages a minute depending on bag size and type of product. Circle No. 112.

Cellophane Storage

American Viscose Corp. has a folder on the storage, handling, and application of its cellophane. This includes twelve rules deserving attention, as well as a check list of things to do to get maximum benefits from this material. Circle No. 113.

Temperature Controls

Fenwal Inc. offers Catalog MC-135, which describes its temperature controls, including physical specifications, performance data, temperature ranges, and details about modifications such as moistureproof seals, armored cable, extended shells, and the like. Applications are also described. Circle No. 114.

Military Packaging

McLaurin-Angier Corp. has a bulletin on its Induwrap, a grade A, grease-

proof wrap meeting the requirements of specification JAN-B-121, including amendments 1 and 2. The bulletin includes a description of the use of this material, such as for machined parts, and enumerations of its anti-corrosion and other properties. References to other pertinent specifications also are included. Circle No. 115.

Piston Fillers

Hope Machine Co. has a 16-page catalog illustrating and describing its piston fillers for liquids, semi-liquids, and semi-solids. Details and speeds of these machines are included. Circle No. 116.

Code Daters

John R. Nalbach Engineering Co. Inc. has a bulletin on its code dating equipment, which is designed to run at speeds from 100 to 400 a minute. Drawings show inline, right angle, and bypass installations. Machine details are included. Circle No. 117.

Polyester Film

Minnesota Mining and Manufacturing Co. has a six-page foldout brochure describing its new Scotchpak brand heat-sealable polyester film. The bulletin includes a tabulation of the specific properties of this material, as well as suggested packaging applications. Minnesota Mining says the film has a tensile strength of 8700 lbs. per square inch and an elongation of 270%. Circle No. 118.

The Number One Selection

The CHAFFEE ROTOR-SEALER

WHY?

Because it seals all popular sealable materials. You may change your package from sealing bag top labels on cellophane, polyethylene, pliofilm and saran to the sealing of unsupported films, viz; cellophane, polyethylene, pliofilm, vinyl by simply turning the thermostat dial.

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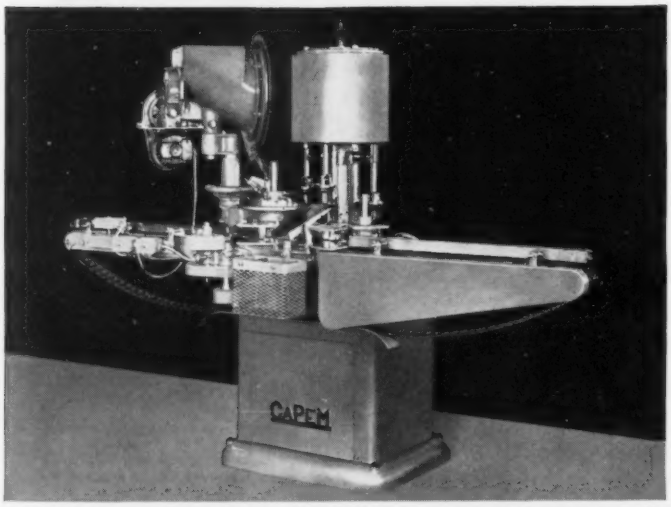
CAPEM THE MODERN SCREW CAPPER



- Applies any type of standard screw cap or cover at speeds of 2,000 to 10,000 per hour.
- Takes container from conveyor line, applies cap perfectly, and returns container to conveyor AUTOMATICALLY without intermediate handling.
- Handles bottles, jars, cans or jugs of any size or shape.
- Delivers a perfect, LEAKPROOF seal at low cost.
- Available in 1, 2, 4, 6 and 8 spindle models.

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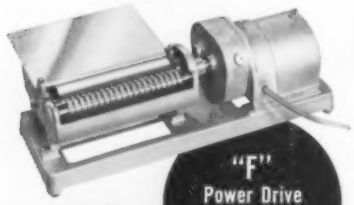

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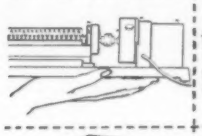
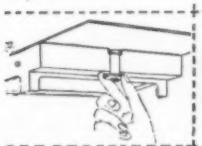
Fast, rugged, efficient. Real value.

"F" Hand Drive
A fine, dependable, low-priced unit.

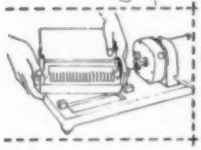
and many others from 6 to 60 inches



true portability



positive control



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King Gluers are saving man-hours every day for thousands of users—and speeding up output. Tops for all manual production labeling — short runs, all-day runs, intermittent use, variety runs. Switch jobs or locations quickly.

Send now for information and prices. Or send us your special problems. King has a gluer for every need. Full line of all-over, strip and marginal machines.

Dealers—write for details.

King Sales and Engineering Company
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Roll Through Labeler

Burt Machine Co. Bulletin "AUS" outlines details about its high speed, non-stop labeler for cans and glass containers. Handling cylindrical packages of 2⅛" to 4¼" diameter by 2" to 7½" high, the machine features a continuous label feed. Circle No. 119.

Automatic Check Weigher

The Exact Weight Scale Co. offers a four-page brochure on its Model 1200 Selectrol, an automatic check weighing machine. It sorts filled packages into precise over, under, and correct weight groups at speeds up to 100/min., handling packages up to 5 lbs. Circle No. 120.

Electronic Counters

Post Machinery Co. Bulletin "B" enumerates features of ten different models of electronic production counting instruments. They are used to operate a control when the desired count is reached, thus regulating the flow of product. Circle No. 121.

Wrapping With Paper

The KVP Company has issued a booklet, "The Mechanics of Packaging." It describes the best methods of handling flexible protective coated papers in storage, and in overwrapping. It also lists the causes of wrapping machine troubles. Circle No. 122.

Net Weigher

U.S. Automatic Box Machinery Co., Inc. has an information sheet listing features of the Scott net weigher. A precision machine, it is available in four models that handle fills of 1 oz. up to 5 lbs., at speeds up to 40 weighings/min. Unit is adapted to free flowing and semi-free flowing dry products. Circle No. 123.

Carton Check Weigher

Toledo Scale Co. lists specifications for its Automatic Carton Classifier in an illustrated data sheet. The unit handles cartons weighing over 5 lbs. at speeds up to 15/min., rejecting underweight cartons. Circle No. 124.

Adhesives Handling

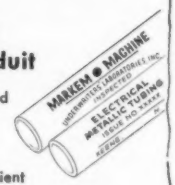
National Adhesives Div. has prepared a helpful booklet, "How To Prepare and Use Glues, Pastes and Gums." It tells how to store and care for glue, how to thin prepared glues and pastes, and reviews six different general types of adhesives. Circle No. 125.

Net Weighers

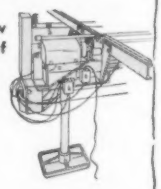
Triangle Package Machinery Co. provides detailed information about the new "Elec-Tri-Pak" net weighers in a current brochure. Five models are described for filling into cartons, bags, cans, or jars. Weights filled range from a fraction of an ounce to 5 lbs. Circle No. 126.

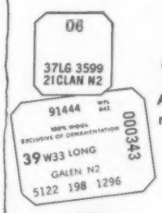
MARKEM
solved these marking problems

marking rigid electrical conduit



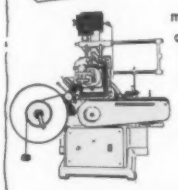
Manufacturer had used decals and labels to identify conduit and tubing, but wanted a more permanent, efficient method. A Markem Model 86A machine now marks ten foot lengths of conduit at production rates, with maker's name, trademark, U. L. issue number and other detail.





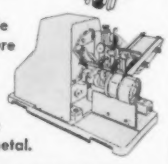
printing clothing tickets

A new garment ticketing method using a Markem 126C machine has reduced labor, time and trouble for a leading clothing manufacturer. "Jokers" are eliminated — one ticket now replaces two — and the 126 automatically prints tickets in 2 colors, cuts off, stacks and counts them.



marking vacuum tubes

Tubes are now marked with manufacturer's name, trademark, type, etc., as fast as 7000 per hour, on efficent Markem 20A machines. Interchangeable, calibrated, adjustable chutes accept miniature to large sizes, and special Markem marking compounds assure clear, durable prints on glass and metal.



***Modern* marking, that matches today's production and marketing needs, is Markem's business. Make your mark *better* by calling Markem Machine Co., Keene 35, N. H.**

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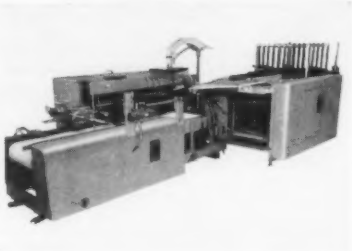
NEW! High Speed

AUTOMATIC GLASS UNLOADER AND UNSCRAMBLER

Patents Applied For



● Self-timed by the cartons themselves with vacuum opening the flaps, lifting and depositing cartons onto the STYL-O-MATIC Walkie-Pushie Unscrambler where they are discharged in single line to filler. Completely adjustable for most standard sizes in 5 minutes.

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Cady Exact Hand Model Micrometer Shown Designed for Portability; Other Models available . . .

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Manufacturers 674 N. Harlem Ave.
RIVER FOREST, ILLINOIS

Circle No. 234 on Card

Film Slitter and Rewinder

Hobbs Manufacturing Co. describes the Model J-450 slitter and rewinder. This is a low cost converting machine that slits paper, plastic films and laminations at speeds up to 200 ft./min. Roll widths available are 36½", 41½", 46½". Circle No. 127.

Wrapping Machines

Elgin Manufacturing Co. lists features of its Model GSA, fully automatic wrapper in a current bulletin. The machine handles heat sealing cellophane, waxed paper, foil, glassine, etc. Package range: 3" to 12" long, 1" to 7½" wide, ¾" to 3" high. Speed can be varied from 10 to 80/min. Circle No. 128.

Folding Carton Sealer

Container Equipment Corp. offers an illustrated bulletin listing features of the Ceco adjustable carton sealer. Adjustable without tools, this machine automatically glue seals both ends of every carton size from 1⅞" to 12" deep, ⅝" to 9" long, and ⅝" to 3½" wide. Speeds range from 30 to 120/min. Circle No. 129.

Weighing and Filling Machine

Walter J. Reynolds Co. information sheet describes a double dumping weigh bucket on a precision scale lever that is fed by dual vibrators. It discharges into bags that are supported by an indexing turret with agitating spouts that settle the product. It handles confections, potato chips, etc., at 50/min. in quantities of 1 oz. to 5 lbs. Circle No. 130.

Versatile Wrappers

Wrap-King Corp. has published an eight-page bulletin that describes four models of its wrappers. They wrap round, disc shaped, oblong, oval, square or irregular shaped products, either hard or soft. These units handle cellophane, glassine, plastic films, and paper. Speeds range up to 140/min. Circle No. 131.

Conveyor Chain

Chain Belt Co. Bulletin 54-60 gives useful information about its line of conveyor chain. It shows a comparison table of the strengths, dimensions and weights of ten different conveyor chains available. Suggested conveyor designs are illustrated, and formulas are given for determining chain pull and horsepower. Circle No. 132.

Heat Seal Wrappers

Scandia Manufacturing Co. offers a data sheet on Model SUS wrapping machines. Using roll fed cellophane, waxed paper, etc., this equipment is available in two sizes that handle packages ⅜" to 3¾" high, 2" to 14" wide, and 2" to 10" long. Speeds range up to 60/min. Crcle No. 133.

Vacuum Filler

Machinery Service Co. has a brochure that lists features of the M-S rotary vacuum filler. Available in 12,

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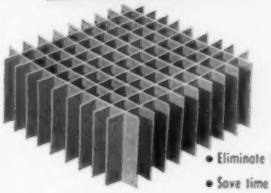

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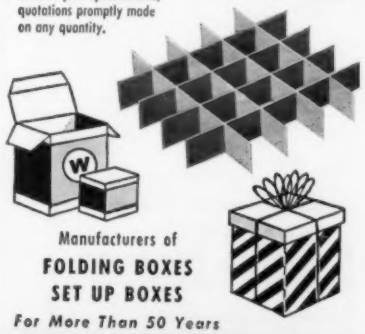

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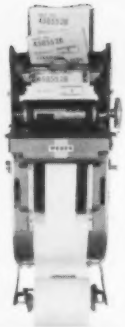

New Weber Dual-80 Label Printing Machine prints product and content identification labels at 105 a minute.

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- Completely automatic
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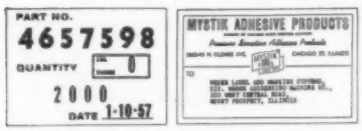

DUAL-PURPOSE, the Weber Model 80 Label Printing Machine, will print from Weber stencils as well as rubber plates. Printing head and ink fountain are quickly and easily detached without tools and stencil drum is substituted for printing shipping labels, packing slips and other small multiple forms.

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Weber

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Division of Weber Addressing Machine Co., Inc.
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- 18 or 24 filling tube models, the unit is designed for high speed filling of any free flowing liquids, light or heavy, foamy or syrupy. Circle No. 134.

Net Weighers

Frazier & Son data sheet lists operating features of the Whiz-Packer net weighing machine. Available in floor models or bench models, these units handle chow mein noodles, candies, potato chips, pretzels, hardware and other hard to fill products. Machine can weigh from below 1 oz. to 3 lbs., at speeds up to 30/min. Circle No. 135.

Measuring gas transmission of flexible materials in pouch form

(Continued from Page 25)

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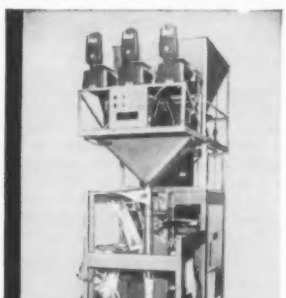

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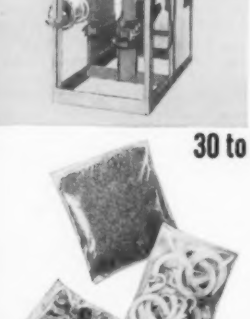

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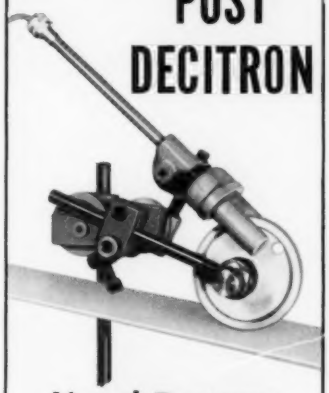

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What we think

It is about time someone took a look at the plight of the plant caught in today's technological strait-jacket — whose managers are the "forgotten men" of our incredible surge toward packaging line mechanization. These luckless folks are those who handle large numbers of short and varying runs — with frequent changes of container size, accompanied by clean-up difficulties due to product differences.

We suggest that these companies unable to capitalize on mechanization consider a two-fold approach: (1) Take a limited but realistic view of equipment and machinery applications, and (2) try their own hand at developing some specialized units. Once they launch this effort, they should have no trouble interesting and encouraging the makers of packaging machinery to go along with them.

Packaging automation is here

Whether you call it "automation" or "mechanization" or anything else, much automatic packaging is already with us and a lot more is on the way. Higher line speeds, closer tolerances of packaging materials, fewer people on packaging lines — all these phases of automation are too well known to require comment. More and more companies are taking advantage of them. Companies are finding they can speed up their packaging lines as an alternative to enlarging their warehouses.

But the trouble is that the stars of automation and mechanization shine most brightly on those plants favored with long-run, high-volume operations — with relatively little change-over for different products or container requirements. Standing far in the shadow of these fortunate operators are those faced with all kinds of product and package variation and diversity.

But all companies can't take advantage of it

The fraternity of those whose crest includes short runs, many changes, lots of clean-up and change-over, and numerous products is a growing one. Far from an exclusive group, it includes large and small companies alike. Their common bond seems to be that they have compared their production schedules and cost sheets for manual and automatic packaging and have concluded that they simply can't fit in much mechanization.

Also, they hasten to point out that many a plant has a beautifully mechanized packaging line that stands idle more hours of the 24 than it should. It seems to confirm their judgment in dismissing mechanization as impractical for their situations. This, we think, is where they are wrong. What they really need, it appears, is a realistic approach to the whole business.

We need a "new look" in mechanization

Perhaps the real trouble is that too many companies shoot for the moon and want all-out mechanization (with the latest control gadgets, including, perhaps, electronic brains) or nothing. When they can't get it because of such bugaboos as clean-up and change-over time that would soak up their automated savings like a sponge they stick to their old methods and operations.

Because of this, they are missing the benefits that limited or partial mechanization would give them. For example, certain semi-automatic units would boost the output of their otherwise manual packaging lines. There's a lot of equipment on the market that would do the job, but goes unnoticed by those who fruitlessly pursue the elusive goal of full automation for a short-run, multi-product plant. We think those running such plants should take another look — through the glasses of limited, partial (and advantageous) mechanization.

Let's have some new equipment

More companies should study the development of equipment to meet their own needs. We do not say they should build their own units because (1) few companies have adequate machinery building organizations, and (2) the established makers of packaging machinery already are equipped for machinery development projects. But we do say that users should study their requirements from a realistic and practical viewpoint in order to launch a machinery research project which an established maker then can carry forward.

A big problem is that of who makes the first investment. The machinery manufacturer already is putting a good-sized chunk of his sales dollar into research. Perhaps if a user with a new idea for equipment does a good bit of the development work and then presents it to an established builder, the results should be a mutual development beneficial to all concerned. The important thing is that there are rich rewards for those who capitalize on the solving of their immediate, specific, limited mechanization problems without waiting for the electronic and operational miracles which some day will bring them full automation.

Bruce Holmgren

Editor

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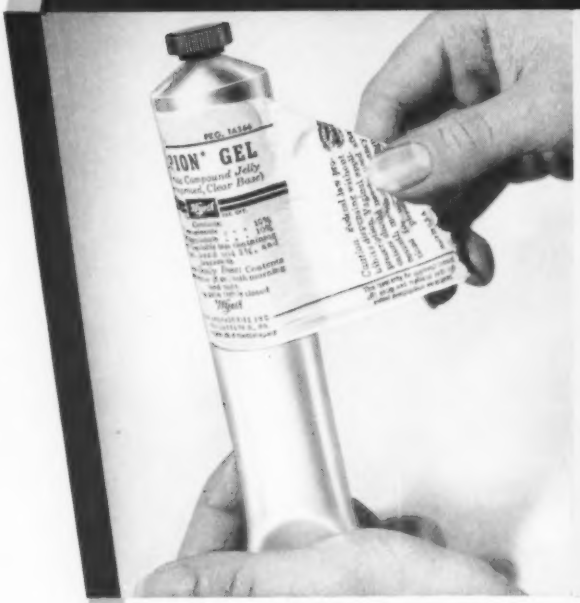

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